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for the refining-natural gasoline industry

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FOREWORD . . . .

A GREATLY enlarged scale of activity characterized the international petroleum industry during 1948, demonstrating again the growing importance of oil operations outside the United States. Drilling and production operations reached new all-time peaks, and pipe line and refining facilities were expanded by very substantial volumes of new construction.

This issue of WORLD OIL, devoted exclusively to global operations, excepting the U. S., has been compiled as a convenient reference source for the growing number of oil men interested in knowing what is happening in other countries. It presents the most complete assemblage of authoritative up-to-date maps and statistical data available anywhere on international drilling, producing, refining plants and pipe line systems. With the exception of the U. S. S. R. and some of its satellite countries, current information is given on operations during 1948 in every country which is experiencing any petroleum development.

Drilling data include number of wells completed in each field, footage drilled, and results of wildcat completions. Current production levels, cumulative recovery, number of producing wells, producing depths, producing formations and other pertinent information are given on all producing fields. Other tables present information on pipe lines and refineries, including their location and capacities.

Of equal importance are the maps, which without question represent the finest and largest collection of oil field maps ever published on world oil areas. Up-to-date maps of every country show size, shape and location of oil and gas fields, pipe line outlets, location of refineries and in many instances dry wildcat tests.

Fine cooperation on the part of oil companies and government departments has made possible the assembling of so much data from all parts of the globe. We extend our sincere thanks to all who furnished information. Without their cooperation we could not feel half so confident that this "International Operations Issue" is the finest reference source for information on oil activities outside the U. S.

—The Editors.

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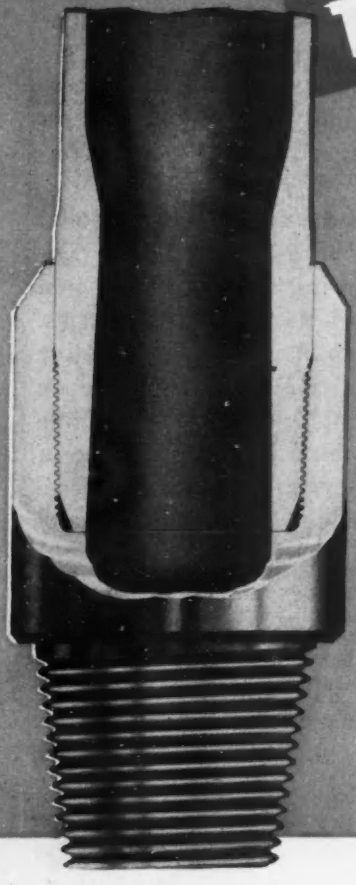

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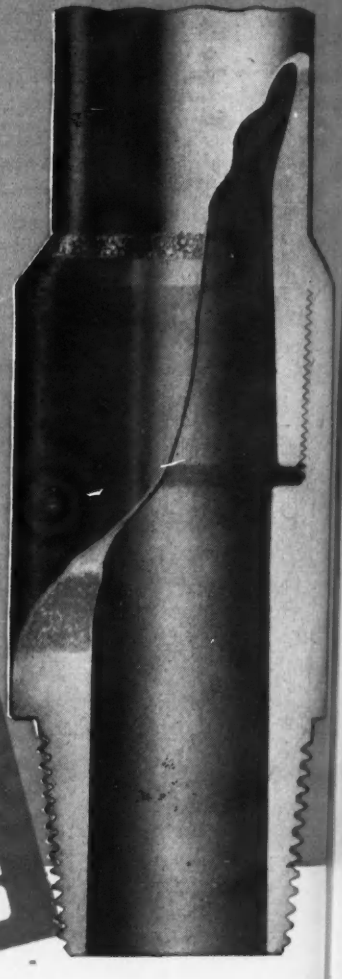

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Editorial Index

To Maps and Data In

WORLD OIL'S INTERNATIONAL OPERATIONS ISSUE

AFRICA, MISCELLANEOUS

Page

Data 224

ALASKA

Data 66

ALBANIA

Data 161

ALGERIA

Data 216
Map 222

ARGENTINA

Data:
- Companies 107
- Completions 110
- Concessions ..... See Maps
- Footage Drilled 110
- Pipe Lines 115
- Production by Fields 107
- Producing Formatiens and Depths 115
- Producing Wells 107
- Refineries 110

Maps:
- Comodoro Rividavia Area 109
- Mendoza Area 104
- Neuquen (Plaza Huincul) Area 104
- Salta Area 108

ARUBA

See Netherlands West Indies

AUSTRALIA

Data 274

AUSTRIA

Data:
- Companies 161
- Production by Fields 161
- Producing Formations and Depths 161
- Producing Wells 161
- Refineries 161

Map 162

BAHAMA ISLANDS

Data 97

BAHREIN ISLAND

Data:
- Companies 245
- Completions 247
- Concessions ..... See Maps
- Footage Drilled 247
- Production by Fields 245
- Producing Formations and Depths 247
- Producing Wells 245
- Refineries 247

Maps 226, 242

BELGIUM

Data 165

BOLIVIA

Data:
- Completions 119
- Footage Drilled 119
- Production by Fields 119
- Producing Formations and Depths 119
- Producing Wells 119
- Refineries 119

Map 117

BORNEO

See East Indies

BRAZIL

Data:
- Completions 124
- Footage Drilled 124
- Production by Fields 119
- Producing Formations and Depths 124
- Producing Wells 119
- Refineries 124

Map 121

BRUNEI

Page

See East Indies

BULGARIA

Data 165

BURMA

Data:
- Producing Fields 250
- Producing Formations and Depths 250
- Refineries 250

Map 250

CANADA

Data:
- Completions 72
- Footage Drilled 72
- Pipe Lines 85
- Production by Fields 66, 77
- Producing Formations and Depths 82
- Producing Wells 66, 77
- Refineries 77

Maps:
- Alberta, Southern Area 74
- Alberta, Central Area 79
- Norman Wells Area 71
- Ontario Area 71

CENTRAL AMERICA

Data 97

CERAM

See East Indies

CHILE

Data:
- Completions 124
- Footage Drilled 124
- Producing Fields 124
- Producing Formations and Depths 124
- Producing Wells 124

Maps:
- Southern Chile 125
- Cerro Manantiales (Springhill) Area 125

CHINA

Data 225

COLOMBIA

Data:
- Companies 127
- Completions 127
- Concessions 127
- Footage Drilled 127
- Pipe Lines 129
- Production by Fields 127
- Producing Formations and Depths 129
- Producing Wells 127
- Wildcat Wells Drilled 129

Map 128

COSTA RICA

See Central America

CUBA

Data 97

CURACAO

See Netherlands West Indies

CYPRUS

Data 225
Map 226

CZECHOSLOVAKIA

Data 165
Map 162

DENMARK

Data 165

DOMINICAN REPUBLIC

Data 97

EAST INDIES

Page

Data:
- Companies 263
- Completions 270
- Footage Drilled 270
- Production by Fields 263
- Producing Formations and Depths 270
- Producing Wells 263
- Refineries 263

Maps:
- Borneo, Balikpapan Fields 261
- Borneo, Tarakan Fields 261
- Brunei Fields 261
- Ceram Fields 265
- Java Fields 265
- New Guinea, Vogelkop Fields 265
- Sarawak Fields 261
- Sumatra, Northern Fields 268
- Sumatra, Central Fields 268
- Sumatra, Southern Fields 273

ECUADOR

Data:
- Companies 132
- Completions 132
- Concessions ..... See Map
- Footage Drilled 132
- Pipelines 132
- Production by Fields 132
- Producing Formations and Depths 132
- Producing Wells 132
- Refineries 132
- Wildcat Wells Drilled 132

Map 130

EGYPT

Data:
- Companies 216
- Completions 216
- Footage Drilled 216
- Production by Fields 216
- Producing Formations and Depths 220
- Producing Wells 216
- Wildcat Wells Drilled 220

Map 219

ETHIOPIA

Data 220

FORMOSA

See China

FRANCE

Data:
- Companies 165
- Completions 168
- Concessions ..... See Maps
- Footage Drilled 168
- Pipe Lines 168
- Production by Fields 165
- Producing Formations and Depths 170
- Producing Wells 165
- Refineries 168
- Wildcat Wells Drilled 168

Maps:
- Pechelbronn Area 167
- Southern Area 167

FRENCH EQUATORIAL AFRICA

See Africa, Miscellaneous

GERMANY

Data:
- Companies 173
- Completions 170
- Footage Drilled 170
- Pipe Lines 177
- Production by Fields 173
- Producing Formations and Depths 177
- Producing Wells 173
- Refineries 173
- Wildcat Wells Drilled 181

Maps:
- Border Area 175
- Hamburg Area 175
- Hanover Area 178
- Heide Area 175

EDITORIAL INDEX—Continued from Page 37

GREAT BRITAIN

Page

Data:
- Production by Fields....184
- Producing Formations and Depths....184
- Producing Wells....184
- Refineries....184
- Wildcat Wells Drilled....184

Map....183

GUATEMALA

See Central America

HAITI

Data....97

HUNGARY

Data:
- Completions....188
- Drilling Footage....188
- Production by Fields....188
- Producing Formations and Depths....188
- Producing Wells....188
- Refineries....188

Map....186

INDIA

Data....255

IRAN

Data:
- Companies....225
- Completions....225
- Concessions....See Maps
- Footage Drilled....225
- Production by Fields....225
- Producing Formations and Depths....232
- Producing Wells....225
- Refineries....232

Maps....226, 231

IRAQ

Data:
- Companies....232
- Completions....232
- Concessions....See Maps
- Footage Drilled....232
- Pipe Lines....237
- Production by Fields....232
- Producing Formations and Depths....237
- Producing Wells....232
- Refineries....237

Maps....226, 234

ITALY

Data....192
Map....191

JAPAN

Data:
- Companies....257
- Completions....258
- Footage Drilled....258
- Production by Fields....257
- Producing Wells....257
- Refineries....258
- Wildcat Wells Drilled....258

JAVA

See East Indies

KUWAIT

Data:
- Companies....237
- Completions....237
- Concessions....See Maps
- Footage Drilled....237
- Production by Fields....237
- Producing Formations and Depths....237
- Producing Wells....237

Maps....226, 239

LEBANON

Data....245
Map....226

MADAGASCAR

See Africa, Miscellaneous

MEXICO

Data:
- Completions....89
- Footage Drilled....89
- Pipe Lines....93
- Production by Fields....89
- Producing Formations and Depths....93
- Producing Wells....89
- Refineries....93

Maps:
- Isthmus Area....87
- Northeastern Area....87
- Panuco-Golden Lane Area....90

MIDDLE EAST

Data....225
Map....226

MOROCCO

Page

Data:
- Completions....
- Footage Drilled....
- Pipe Lines....224
- Production by Fields....220
- Producing Formations and Depths....224
- Producing Wells....220
- Wildcat Wells Drilled....224

Map....222

NETHERLANDS

Data:
- Completions....192
- Footage Drilled....192
- Production by Fields....192
- Producing Formations and Depths....192
- Producing Wells....192

Map....175

NETHERLANDS NEW GUINEA

See East Indies

NETHERLANDS WEST INDIES

Data....160

NEUTRAL ZONE (KUWAIT)

Data....245
Map....226

NEW ZEALAND

Data....274

NICARAGUA

See Central America

NIGERIA

See Africa, Miscellaneous

NORWAY

Data....196

PAKISTAN

Data....255

PALESTINE (Including Israel)

Data....245
Map....226

PANAMA

See Central America

PAPUA

See East Indies

PARAGUAY

Data....136

PERU

Data:
- Companies....136
- Completions....136
- Concessions....See Maps
- Footage Drilled....136
- Production by Fields....136
- Producing Formations and Depths....138
- Producing Wells....136
- Refineries....138
- Wildcat Wells Drilled....136

Map....135

PHILIPPINES

Data....258

POLAND

Data:
- Completions....196
- Footage Drilled....196
- Production by Fields....196
- Producing Wells....196
- Refineries....196

Maps:
- Debowiec Gas Area....195
- Southern Area....195

PORTUGAL

Data....200

PORTUGUESE EAST AFRICA

See Africa, Miscellaneous

QATAR

Data....245
Maps....226, 242

ROUMANIA

Data:
- Producing Formations....200
- Refineries....200

Maps:
- Ploesti Area....198
- Targul Mures Area....198

SARAWAK

See East Indies

SAUDI ARABIA

Data:
- Companies....245
- Completions....247
- Concessions....See Maps
- Footage Drilled....247
- Pipe Lines....247
- Production by Fields....245
- Producing Formations and Depths....247
- Producing Wells....245
- Refineries....247

Maps....226,242

SPAIN

Page

Data....205

SUMATRA

See East Indies

SWEDEN

Data....205

SYRIA

Data....247
Map....226

TRANSJORDAN

Data....247
Map....226

TRINIDAD

Data:
- Companies....97
- Completions....98
- Footage Drilled....98
- Pipe Lines....98
- Production by Fields....97
- Producing Formations and Depths....98
- Producing Wells....97
- Refineries....98

Map....101

TUNISIA

Data....224

TURKEY

Data....248
Maps....226, 248

UNION OF SOUTH AFRICA

See Africa, Miscellaneous

UNION OF SOVIET SOCIALIST REPUBLICS

Data:
- Pipe Lines....205, 212
- Producing Formations and Depths..209, 212
- Refineries....212

Maps:
- Asiatic Russia....214
- Baku (Azerbaijan) Area....206
- Carpathian (Former Polish) Area....203
- Crimea-Maikop Area....206
- Daghestan Area....206
- Emba Basin Area....211
- European Russia....203
- Grozny Area....206
- Kama River Area....211
- Sakhalin Island Area....214
- South Georgian Area....206
- Turkmen Area....214
- Ukraine Area....203
- Ural Area....211
- Uzbek-Tadzhik-Kirgiz (Fergana) Area..214
- Volga Area....211

UNITED STATES

Data....95

URUGUAY

Data....138

VENEZUELA

Data:
- Companies....145
- Completions....149
- Footage Drilled....149
- Pipe Lines....160
- Production by Fields....145
- Producing Formations and Depths....152
- Producing Wells....145
- Refineries....160

Maps:
- Central Area....143
- Eastern Areas....146, 151
- Northwestern Areas....154
- Southwestern Area....159

WORLD

Data:
- Completions and Footage Drilled....54
- Crude Oil Production, by Countries, by Years....46, 47, 48
- Crude Oil Production, Daily and Annual Rates....44
- Demand and Supply....42
- Principal Companies Operating Outside U. S....63, 64
- Producing Oil Wells....57
- Refining Capacity, End of 1948....59

Charts:
- Average Yield per well, by Major Areas. 56
- Completions 1947-1948, by Areas....52
- Crude Oil Production....43
- Demand and Supply....41
- Principal Producing Areas Outside of U. S....45
- Producing Oil Wells, by Major Areas...56
- Refining Capacity, by Major Areas....59

YUGOSLAVIA

Data....205

WORLD PETROLEUM DEMAND AND SUPPLY

DESPITE a very large gain in consumption, such a great increase occurred in the available supply of petroleum during 1948 that once again the world had more than enough oil to satisfy its needs. This was in contrast with the preceding year, when demand exceeded the available supply by a substantial amount.

Rising sharply to a new all-time peak, the world's supply of petroleum (crude, natural gasoline and synthetic products) averaged 9,776,600 barrels per day during 1948. This represented an increase of 12.3 percent or 1,074,000 barrels per day above the 1947 average of 8,702,600 barrels daily.

Meanwhile, the gain in demand was only one-half as large as the increase in supply. Consumption gained by only 6.5 percent or 567,700 barrels daily over 1947 rates to average 9,305,300 barrels per day. Consequently, the amount produced exceeded demand by 471,300 barrels daily, whereas in 1947 demand had been 156,900 barrels larger than the available supply.

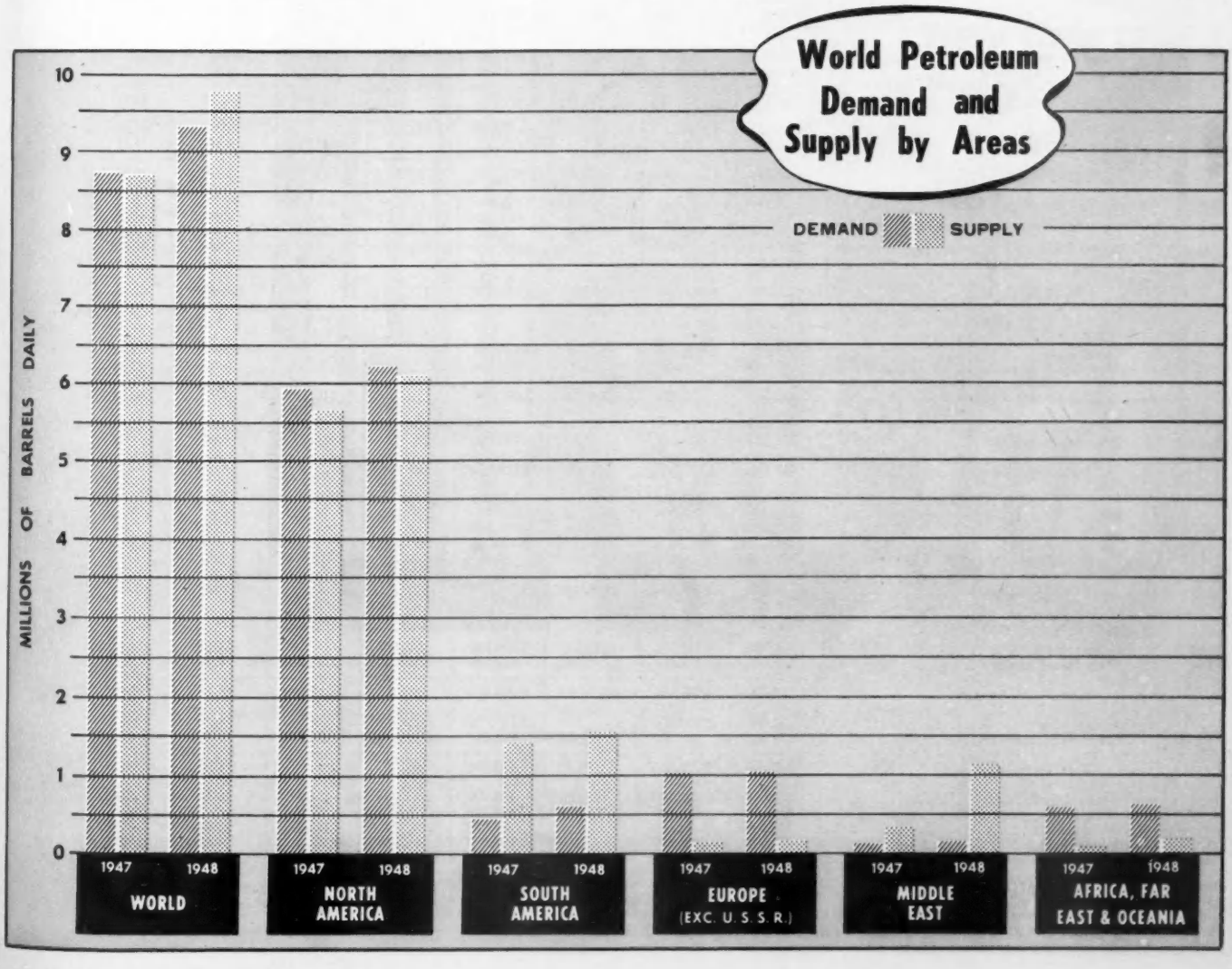
The 1948 supply was made up of 9,331,200 barrels of crude and 445,000 barrels of natural gasoline and synthetic products. Both crude and natural gasoline-synthetic products were produced in bigger quantities than at any previous time. World production of crude was 1,049,500 barrels per day or 12.7 percent greater than in 1947, while output of natural gasoline and synthetic products was increasing 24,300 barrels daily or by 5.7 percent.

During 1948 only three major geographical regions of the world produced more petroleum than they consumed, hence the numerous shortage areas were necessarily dependent upon these regions for enough oil to make up the difference between their domestic supply and needs.

The three surplus producing regions were the Caribbean area of northern South America, the Middle East group of countries in Asia, and the U. S. In 1947 only the Caribbean and Middle East countries produced surplus amounts. Since these three regions produced 87 percent of the world's supply and consumed but 66 percent of the oil, together they had a surplus supply of 2,350,500 barrels per day available to satisfy the needs of other countries.

The Caribbean region, comprising the fields of Venezuela, Colombia and Trinidad, continued to be the world's largest surplus petroleum area. Production in this region, due primarily to Venezuela, has risen sharply in recent years, enabling the territory to enlarge steadily its export shipments. Caribbean production amounted to 1,462,400 barrels daily in 1948 as compared with 1,318,400 barrels in 1947 and with 1,181,800 barrels in 1946. These producing rates exceeded Caribbean consumption by 1,244,500 barrels daily in 1948, compared with 1,136,800 barrels in 1947 and with 1,028,800 barrels in 1946. Consumption in these countries in 1948 was only 2.34 percent of the world total, while their production was 14.9 percent.

In recent years the Middle East area has shown the largest rate of growth as a surplus producing region. This territory, embracing Iran, Iraq, Bahrein, Saudi Arabia, Kuwait and Turkey, increased its daily production from



WORLD PETROLEUM DEMAND AND SUPPLY—Continued

690,400 barrels in 1946 to 1,136,400 barrels in 1948. Consequently, quantities available for export shipments from the Middle East, after satisfying domestic requirements, jumped from 545,000 barrels in 1946 to 671,500 barrels during 1947, and to 959,000 barrels per day in 1948.

The U. S. accounted for more than one-half of the increase which occurred in world demand, its consumption during 1948 having been 310,800 barrels per day more than in 1947 while the rest of the world was recording a gain of 256,900 barrels. U. S. demands totaled 5,760,000 barrels daily, or 61.9 percent of all the petroleum consumed. Consumption for the rest of the world amounted to 3,545,300 barrels per day.

Despite the large growth in demand, U. S. producing rates increased so sharply it had a surplus supply of 147,000 barrels per day in 1948, whereas in the preceding year supply had been in exact balance with consumption. Nevertheless, the nation continued to import large quantities of foreign oil, imports averaging 505,000 barrels daily in 1948. With export shipments amounting to only 374,500 barrels per day, its domestic surplus supply plus large importation rates, resulted in 280,000 barrels per day being added to storage. Thus, almost 60 percent of the 471,300 barrels which went to storage daily during 1948 was accumulated in the U. S.

Europe, excluding the USSR, continued to be the major shortage area of the world. Declining production and rising demand increased its dependence on other regions for enough oil to meet requirements. Domestic production of both crude and petroleum products dropped from 182,600 barrels daily in 1946 to 161,900 barrels per day in 1947, and to 153,300 barrels in 1948. Meanwhile, domestic demand in Europe rose from 808,300 barrels per day in 1946 to 1,010,600 barrels in 1947, and to 1,063,500 barrels in 1948. Consequently, Europe's demand in 1948 exceeded its local supply by 910,200 barrels per day, in contrast with a supply shortage of 848,700 barrels daily in 1947 and 625,700 barrels in 1946.

The combined Far East and Oceania region also was dependent to a very large extent on other areas for enough petroleum to satisfy its requirements, producing less than 2 percent of the world's supply while using nearly 5 percent of the world's requirements. Consequently, this region's demand exceeded its supply by 274,800 barrels daily. However, this compared with 349,000 barrels per day in 1947.

Figures presented herewith on world supply and demand were compiled by C. J. Bauer, petroleum economist with Standard Oil Company (N. J.).

Petroleum Demand and Supply by Areas, 1946-1947-1948

Barrels Per Day

	Domestic Demand	DOMESTIC SUPPLY			Excess Supply Over Demand	Excess Demand Over Supply	PERCENT OF WORLD TOTAL	
		Crude Oil	Natural Gasoline, Etc.	Total			Domestic Demand	Domestic Supply
1948								
United States	5,760,000	5,509,000	398,000	5,907,000	147,000	.....	61.90	60.42
Other North America	454,700	192,500	1,800	194,300	.....	260,400	4.89	1.99
Total North America	6,214,700	5,701,500	399,800	6,101,300	.....	113,400	66.79	62.41
Caribbean Area	217,900	1,458,700	3,700	1,462,400	1,244,500	.....	2.34	14.96
Other South America	385,800	112,000	4,600	116,600	.....	269,200	4.15	1.19
Total South America	603,700	1,570,700	8,300	1,579,000	975,300	.....	6.49	16.15
Europe (Excluding U.S.S.R.)	1,063,500	131,900	21,400	153,300	.....	910,200	11.43	1.57
U.S.S.R.	618,000	600,000	12,000	612,000	.....	6,000	6.64	6.26
Africa	195,300	36,000	700	36,700	.....	158,600	2.10	0.38
Middle East	177,400	1,136,400	.....	1,136,400	959,000	.....	1.90	11.62
Far East and Oceania	432,700	154,700	3,200	157,900	.....	274,800	4.65	1.61
TOTAL WORLD	9,305,300	9,331,200	445,400	9,776,600	471,300	.....	100.00	100.00
1947								
United States	5,449,200	5,085,200	364,000	5,449,200	.....	.....	62.36	62.62
Other North America	487,300	174,500	2,300	176,800	.....	310,500	5.58	2.03
Total North America	5,936,500	5,259,700	366,300	5,626,000	.....	310,500	67.94	64.65
Caribbean Area	181,600	1,314,600	3,800	1,318,400	1,136,800	.....	2.08	15.15
Other South America	262,300	102,700	3,300	106,000	.....	156,300	3.00	1.22
Total South America	443,900	1,417,300	7,100	1,424,400	980,500	.....	5.08	16.37
Europe (Excluding U.S.S.R.)	1,010,600	128,300	33,600	161,900	.....	848,700	11.57	1.86
U.S.S.R.	578,000	543,000	10,000	553,000	.....	25,000	6.62	6.35
Africa	180,300	25,500	1,000	26,500	.....	153,800	2.06	0.30
Middle East	168,800	840,300	.....	840,300	671,500	.....	1.93	9.66
Far East and Oceania	419,500	67,400	3,100	70,500	.....	349,000	4.80	0.81
TOTAL WORLD	8,737,600	8,281,500	421,100	8,702,600	.....	35,000	100.00	100.00
1946								
United States	4,906,700	4,749,100	321,200	5,070,300	163,600	.....	63.13	63.94
Other North America	440,000	156,400	3,200	159,600	.....	280,400	5.66	2.02
Total North America	5,346,700	4,905,500	324,400	5,229,900	.....	116,800	68.79	65.96
Caribben Area	153,600	1,177,500	4,300	1,181,800	1,028,200	.....	1.97	14.90
Other South America	223,600	98,200	3,300	101,500	.....	122,100	2.88	1.28
Total South America	377,200	1,275,700	7,600	1,283,300	906,100	.....	4.85	16.18
Europe (Excluding U.S.S.R.)	808,300	136,400	46,200	182,600	.....	625,700	10.40	2.30
U.S.S.R.	514,700	438,200	9,000	447,200	.....	67,500	6.62	5.64
Africa	160,000	24,500	.....	24,500	.....	135,500	2.06	0.31
Middle East	145,000	690,400	.....	690,400	545,400	.....	1.87	8.71
Far East and Oceania	420,700	67,400	4,200	71,600	.....	349,100	5.41	0.90
TOTAL WORLD	7,772,600	7,538,100	391,400	7,929,500	156,900	.....	100.00	100.00

Source: C. J. Bauer, Petroleum Economist, Standard Oil Company (New Jersey).

WORLD CRUDE PRODUCTION

CRUDE oil production rose very sharply during 1948 to another new all-time peak, world output for the year having been 388½ million barrels more than the record volume produced during 1947. During the year world production of crude totaled 3,410,491,000 barrels, in contrast with 3,022,030,000 barrels in the preceding year. This was the greatest increase in producing rates in history.

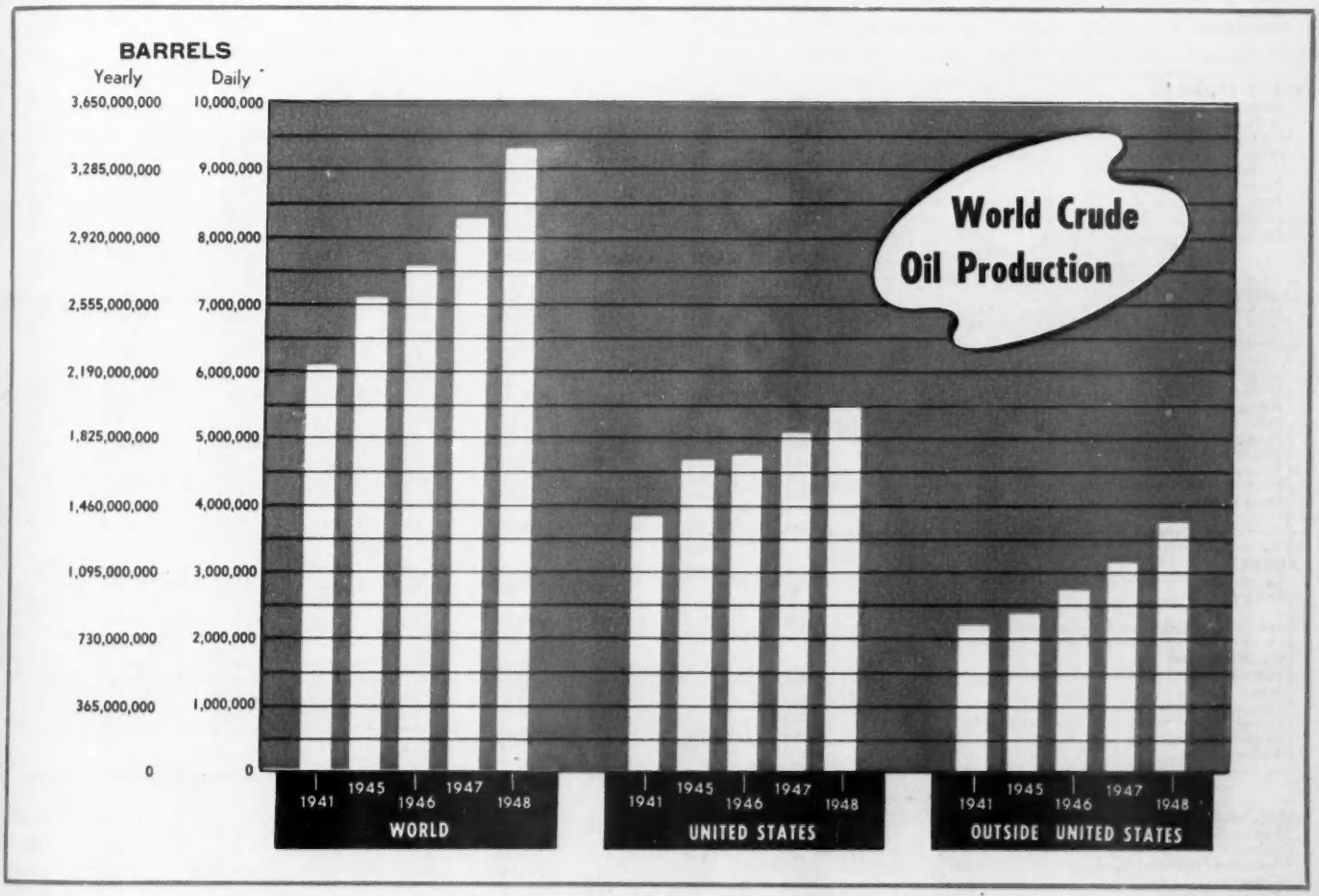
In terms of daily average yields, 1948 output was 9,318,281 barrels as compared with 8,279,534 in 1947 and 7,536,178 barrels in 1946. Thus, 1948 production exceeded the 1947 rate by slightly more than 1 million barrels daily or 12.5 percent, and was 1¾ million barrels per day larger than in 1946.

Increased production was recorded in many countries, but the sharp advance in global crude output was attained primarily through enlarged production rates established in the U. S., Middle East, East Indies, and Venezuela. The greatest gain in producing rates was in areas outside of the U. S., marking the third consecutive year in which increased production of the U. S. was not as large as the increase in other countries.

During 1948 the U. S. recorded an increase of 423,742 barrels daily or 8.3 percent, while the rest of the world was boosting its recovery by 615,005 barrels or 19.2 percent. In 1947, U. S. production increased 334,725 barrels daily over 1946, and the combined output of all other countries jumped 408,609 barrels per day over the previous year. These increases in the past three years represent a decided change over preceding years, and when the U. S. always enlarged its production more than the rest of the world.

This trend of the U. S. producing a smaller share of the world's oil is expected to be accelerated in 1949. It is indicated that world production in 1949 will attain another all-time high, but that the prospective increase will be negligible and due entirely to areas outside the U. S. Production restrictions have been imposed on U. S. flush fields since the beginning of 1949, presaging that U. S. output for the year is likely to be less than in 1948. On the other hand, production in the Middle East, Canada, the Netherlands Indies and some other countries undoubtedly will be greater than in 1948. The upward march of Venezuela production also appears to have been reached, output in the first half of 1949 having been reduced from the peaks attained late in 1948.

U. S. production in 1948 totaled 2,016,282,000 barrels, representing a daily average yield of 5,508,967 barrels in con-



(All Figures in Barrels)

YEAR	WORLD		UNITED STATES		OUTSIDE U.S.A.		YEAR	WORLD		UNITED STATES		OUTSIDE U.S.A.	
	Annual Total	Daily Average	Annual Total	Daily Average	Annual Total	Daily Average		Annual Total	Daily Average	Annual Total	Daily Average	Annual Total	Daily Average
1938	1,988,041,000	5,466,000	1,214,355,000	3,327,000	773,686,000	2,119,000	1943	2,256,652,000	6,182,600	1,505,613,000	4,125,000	751,039,000	2,057,600
1939	2,086,160,000	5,715,500	1,264,962,000	3,465,600	821,198,000	2,249,900	1944	2,550,954,000	6,969,800	1,677,904,000	4,584,400	873,050,000	2,385,400
1940	2,149,821,000	5,873,800	1,353,214,000	3,367,300	796,607,000	2,176,500	1945	2,594,407,000	7,107,900	1,713,655,000	4,694,900	880,752,000	2,413,000
1941	2,220,657,060	6,084,000	1,402,228,000	3,841,700	818,429,000	2,242,300	1946	2,750,705,000	7,536,200	1,733,939,000	4,750,500	1,016,766,000	2,785 700
1942	2,093,083,000	5,734,500	1,386,645,000	3,799,100	706,438,000	1,935,400	1947	3,022,030,000	8,279,534	1,856,107,000	5,085,225	1,165,923,000	3,194,309
							1948	3,410,491,000	9,318,281	2,016,282,000	5,508,967	1,394,209,000	3,809,314

WORLD CRUDE PRODUCTION—Continued

trast with 5,085,225 barrels produced daily in 1947. Although this was a new peak record considerably above all preceding years, the U. S. accounted for but 59 percent of the world's production. This was the first time since 1906 that the U. S. has failed to produce 60 percent or more of the world's crude production. As recently as 1945, the U. S. was producing 66 percent of the world's output, but since that time it has produced a slightly smaller portion of the world's annual output each succeeding year, although U. S. production has never failed to increase in any of the years.

By far the most phenomenal increases took place in the Persian Gulf region of the Middle East, output for this territory rising 302,000 barrels to a daily average of 1,139,893 barrels, which represented a gain of 36 percent. As a result the Middle East produced 12 percent of the world's production in contrast with only 10 percent in 1947. This volume of recovery was more than twice the volume produced in 1945, when the Middle East produced 632,213 barrels daily.

Iran, Kuwait and Saudi Arabia were responsible for the large gain in Middle East production. Iran's output rose 96,887 barrels or 23 percent to average 520,205 barrels daily. Kuwait produced an average of 127,178 barrels per day during 1948, an increase of 186 percent or 82,626 barrels over its 1947 recovery of 44,452 barrels a day. Saudi Arabia

Trends in World Crude Oil Production, by Countries, and Cumulative Production Through 1948

(Sources: U. S. Bureau of Mines except 1948 from private sources or estimated by WORLD OIL)

CONTINENT and COUNTRY	ANNUAL PRODUCTION (Thousands of Barrels)		DAILY AVERAGE PRODUCTION (Actual Barrels)			YEAR'S PRODUCTION As Percent of World		CUMULATIVE PRODUCTION TO JANUARY 1, 1949 (Thousands of Barrels)*	
	1947	1948	1947	1948	% Diff. '47-'48	1947	1948	Total	As % of World
NORTH AMERICA:									
Canada	7,632	12,361	20,909	33,773	+ 61.5	0.25	0.36	141,144	0.24
Cuba	300	112	822	306	— 62.8	0.01	0.01	1,872	....
Mexico	56,284	58,370	154,203	159,481	+ 3.4	1.86	1.71	2,348,863	4.03
United States	1,856,107	2,016,282	5,085,225	5,508,967	+ 8.3	61.42	59.12	37,098,791	63.60
Total North America	1,920,323	2,087,125	5,261,159	5,702,527	+ 8.4	63.54	61.20	39,590,670	67.87
SOUTH AMERICA:									
Argentina	21,846	22,992	59,852	62,819	+ 5.0	0.72	0.67	411,486	0.70
Barbados	.....	.....	.....	.....	.....	.....	.....	8	....
Bolivia	375	464	1,027	1,268	+ 23.5	0.01	0.01	4,291	0.01
Brazil	97	143	266	391	+ 47.0	....	0.01	530	....
Colombia	25,882	24,371	70,909	66,587	— 6.1	0.86	0.71	443,300	0.76
Ecuador	2,282	2,611	6,252	7,134	+ 14.1	0.08	0.08	43,829	0.07
Peru	12,764	14,069	34,970	38,440	+ 9.9	0.42	0.41	371,672	0.64
Trinidad	20,521	20,202	56,222	55,197	— 1.8	0.68	0.59	371,879	0.64
Venezuela	434,885	489,985	1,191,466	1,338,757	+ 12.4	14.39	14.37	4,521,597	7.75
Total South America	518,652	574,837	1,420,964	1,570,593	+ 10.5	17.16	16.85	6,168,592	10.57
EUROPE:									
Albania	1,800	358	4,932	978	— 80.2	0.06	0.01	11,832	0.02
Austria	6,285	5,711	17,219	15,604	— 9.4	0.21	0.17	51,383	0.09
Czechoslovakia	210	187	575	511	— 11.1	0.01	0.01	4,124	0.01
France	363	362	995	989	— 0.6	0.01	0.01	13,986	0.02
Germany	4,035	4,447	11,055	12,150	+ 9.9	0.13	0.13	92,761	0.16
Great Britain	351	323	962	883	— 8.2	0.01	0.01	4,132	0.01
Hungary	4,330	3,581	11,863	9,784	— 17.5	0.14	0.11	42,134	0.07
Italy	80	65	219	178	— 18.7	....	....	3,443	0.01
Netherlands	1,478	3,444	4,049	9,410	+132.4	0.05	0.10	5,412	0.01
Poland	951	989	2,605	2,702	+ 3.7	0.03	0.03	277,438	0.48
Roumania	28,552	29,500	78,225	80,601	+ 3.0	0.95	0.86	1,187,386	2.03
U.S.S.R. (Excl. Sakhalin)	187,463	207,850	513,597	567,896	+ 10.6	6.21	6.09	6,048,698	10.37
Other Europe	365	366	1,000	1,000	.....	0.01	0.01	2,147	....
Total Europe	236,263	257,183	647,296	702,686	+ 8.6	7.82	7.54	7,744,876	13.28
AFRICA									
Egypt	8,627	13,173	23,636	35,992	+ 52.3	0.29	0.39	120,280	0.21
Other Africa	23	96	63	262	+315.9	....	....	558	....
Total Africa	8,650	13,269	23,699	36,254	+ 53.0	0.29	0.39	120,838	0.21
ASIA, Middle East									
Bahrein	9,411	10,915	25,784	29,822	+ 15.7	0.31	0.32	98,915	0.17
Iran	154,511	190,395	423,318	520,205	+ 22.9	5.11	5.58	1,938,190	3.32
Iraq	35,834	26,466	98,175	72,311	— 26.3	1.19	0.78	411,587	0.71
Kuwait	16,225	46,547	44,452	127,178	+186.1	0.54	1.36	68,703	0.12
Saudi Arabia	89,852	142,853	246,170	390,309	+ 58.6	2.97	4.19	345,051	0.59
Turkey	.....	25	.....	68	+ 68.0	....	....	25	....
Total Middle East	305,833	417,201	837,899	1,139,893	+ 36.0	10.12	12.23	2,862,471	4.91
ASIA, Far East									
Borneo, British (Sarawak and Brunei)	12,970	18,588	35,534	50,787	+ 42.9	0.43	0.54	157,240	0.27
Burma	800	300	2,192	820	— 62.6	0.03	0.01	337,596	0.58
India and Pakistan	1,863	2,490	5,104	6,803	+ 33.3	0.06	0.07		
China	378	532	1,036	1,454	+ 40.3	0.01	0.02	3,300	0.01
Formosa (Taiwan)	18	17	49	47	— 6.1	....	....	250	....
Japan	1,258	1,291	3,446	3,527	+ 2.4	0.04	0.04	95,170	0.16
Netherlands Indies (Neth. Borneo, Java, Sumatra, Ceram, New Guinea)	8,020	31,906	21,973	87,175	+296.7	0.27	0.94	1,174,571	2.01
Sakhalin (Part of U.S.S.R.)	7,000	5,750	19,178	15,710	— 18.1	0.23	0.17	78,990	0.13
Total Far East	32,307	60,874	88,512	166,323	+ 87.9	1.07	1.79	1,847,117	3.16
ASIA, Total	338,140	478,075	926,411	1,306,216	+ 41.0	11.19	14.02	4,709,588	8.07
AUSTRALIA-NEW ZEALAND	2	2	5	5	.....	....	....	42	....
WORLD, Undistributed	.....	.....	.....	.....	.....	....	....	1,044	....
TOTAL WORLD	3,022,030	3,410,491	8,279,534	9,318,281	+ 12.5	100.00	100.00	58,355,650	100.00

* Figures from Bureau of Mines, except 1948; will not always check with those in other tables which are from private sources.

WORLD CRUDE PRODUCTION—Continued

boosted its yield by 144,139 barrels daily, producing 390,309 barrels per day to record a 58 percent gain. Bahrein recorded a small increase, producing 29,822 barrels daily in comparison with 25,784 barrels the preceding year.

Iraq was the only Middle East country to experience a decrease in output. Its recovery averaged 73,211 barrels daily as compared with 98,175 barrels in 1947. Iraq's drop was due entirely to the interruption of pipe line transportation through the southern lege of the line from Kirkuk because of hostilities in Palestine.

Turkey, another Middle East country, joined the producing ranks for the first time, with an average of 68 barrels daily from its new field just north of Iraq.

Venezuela remained the second largest producing country of the world, establishing a new all-time high record considerably above its preceding peak. Output of Venezuela averaged 1,339,757 barrels daily, a gain of 147,291 barrels or 12 percent. The country's production was nearly three times greater than its average of 486,660 barrels produced daily during 1943.

Most other countries in South America registered small increases, while Trinidad and Columbia were declining slightly. Output in Columbia dropped from a daily average of 70,909 barrels per day in 1947 to 66,587 barrels in 1948, a decrease of 6.1 percent; and Trinidad fell from 56,222 barrels daily to an average of 55,197 barrels in 1948. Argentina boosted its production to 62,819 barrels per day in 1948 as contrasted with 59,852 barrels the preceding year, and Peru climbed from 34,970 barrels to 38,440 barrels per day. Brazil, Bolivia and Ecuador achieved small gains.

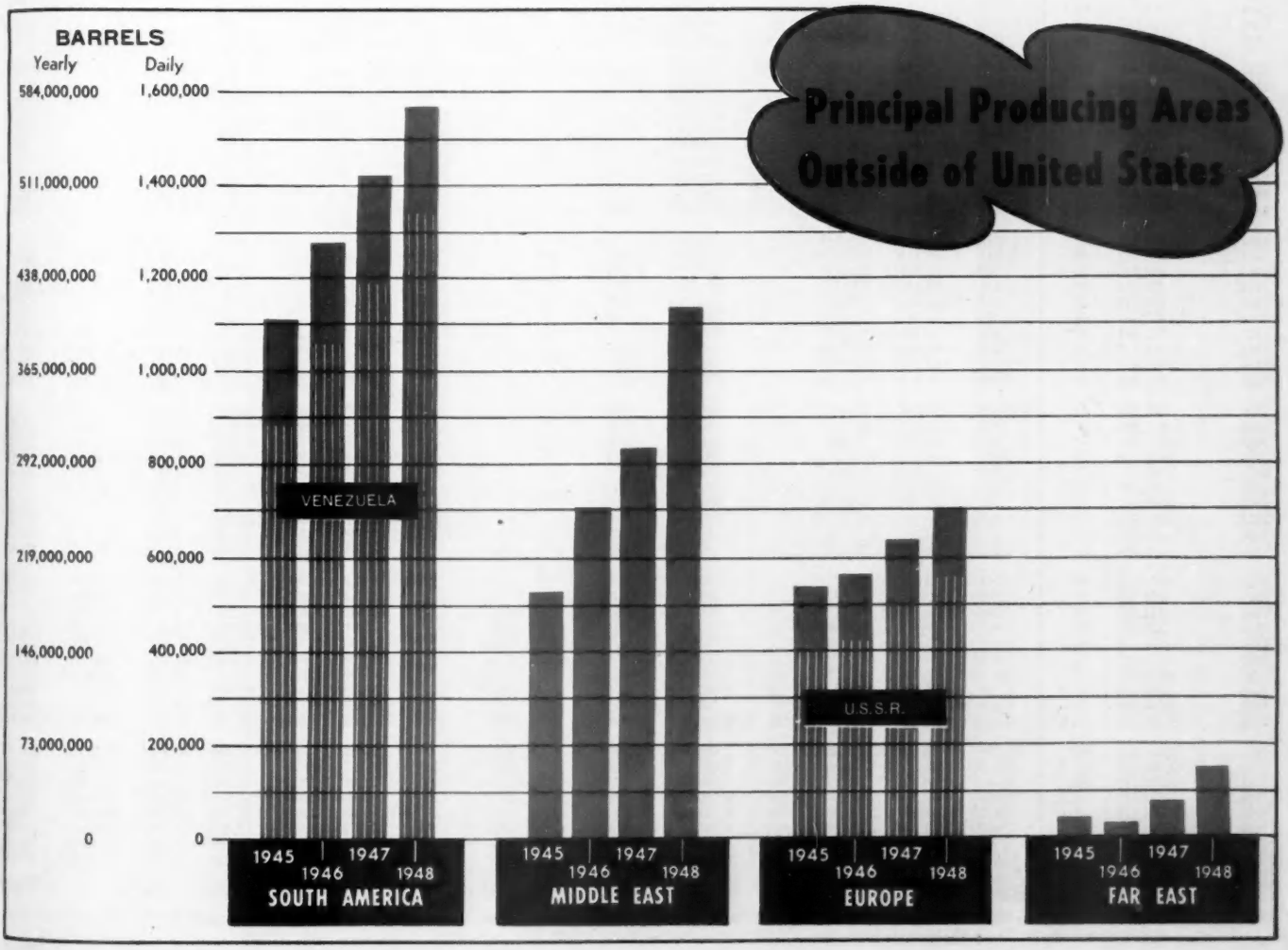
Meanwhile, much was accomplished toward restoration of the East Indies fields to their prewar status. Output of the Netherlands Indies rose 296 percent, production averaging 87,175 barrels daily in contrast with 21,973 barrels in 1947. Prewar production was around 150,000 barrels per day. British Borneo, Sarawak and Brunei increased their production by 42 percent, producing 50,787 barrels daily as compared with 35,534 barrels in 1947. This is much greater than prewar recovery, which averaged less than 20,000 barrels daily.

Canada was another area which contributed heavily to the increased production of crude. Canada's output in 1948 averaged 33,773 barrels daily, an increase of 61 percent over the 20,909 barrels produced in the preceding year.

Another sizeable gain in production is indicated for Canada in 1949. Expanding output of new fields in Western Canada probably will result in the country producing an average of more than 50,000 barrels daily in 1949, and restricted to this amount only because of limited pipe line capacity.

Again reliable information was not available on USSR and its satellite countries, making it necessary to estimate their production. Based upon newspaper and magazine reports, it is estimated the nation's production increased to 567,986 barrels daily in contrast with 513,597 barrels during the preceding year. The Netherlands recovered the most important gain of any European country, output of its single field rising 132 percent in climbing from 4,049, to 9,410 barrels daily.

Egypt also increased its production by a substantial amount, producing 35,992 barrels daily, a gain of 52 percent over its 1947 yield of 23,636 barrels per day.



World Crude Oil Production, By Countries, By Years (Part 1)

(Complete production history of world, in thousands of barrels of 42 U. S. Gallons. Sources: *Mineral Resources and Minerals Yearbook*, except as otherwise indicated)

YEAR	World Total	Percent Produced by U.S.	NORTH AMERICA					SOUTH AMERICA									
			Canada	Mexico	United States	Cuba	Total North America	Argentina	Barbados	Bolivia	Brazil	Colombia	Ecuador	Peru	Trinidad	Venezuela	Total South America
1857	2	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1858	4	....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1859	6	31	.....	.....	2	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1860	509	98	.....	.....	500	.....	500	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1861	2,131	99	.....	.....	2,114	.....	2,114	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1862	3,092	99	12	.....	3,057	.....	3,069	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1863	2,763	94	83	.....	2,611	.....	2,694	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1864	2,304	92	90	.....	2,116	.....	2,206	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1865	2,716	92	110	.....	2,498	.....	2,608	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1866	3,899	92	175	.....	3,598	.....	3,773	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1867	3,709	90	190	.....	3,347	.....	3,537	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1868	3,990	91	200	.....	3,646	.....	3,846	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1869	4,696	90	220	.....	4,215	.....	4,435	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1870	5,799	91	250	.....	5,261	.....	5,511	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1871	5,730	91	270	.....	5,205	.....	5,475	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1872	6,877	92	308	.....	6,293	.....	6,601	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1873	10,338	91	365	.....	9,894	.....	10,259	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1874	11,933	92	169	.....	10,927	.....	11,096	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1875	9,977	88	220	.....	8,788	.....	9,008	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1876	11,051	83	312	.....	9,133	.....	9,445	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1877	15,754	85	312	.....	13,350	.....	13,662	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1878	18,417	84	312	.....	15,397	.....	15,709	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1879	23,601	84	575	.....	19,914	.....	20,489	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1880	30,018	88	350	.....	26,286	.....	26,636	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1881	31,993	86	275	.....	27,661	.....	27,936	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1882	35,704	85	275	.....	30,350	.....	30,625	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1883	30,255	78	250	.....	23,450	.....	23,700	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1884	35,969	67	250	.....	24,218	.....	24,468	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1885	36,765	59	250	.....	21,859	.....	22,109	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1886	47,243	59	584	.....	28,065	.....	28,649	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1887	47,807	59	526	.....	28,283	.....	28,809	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1888	52,165	53	695	.....	27,612	.....	28,307	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1889	61,507	57	705	.....	35,164	.....	35,869	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1890	76,633	60	795	.....	45,824	.....	46,619	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1891	91,100	60	755	.....	54,293	.....	55,048	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1892	88,739	57	780	.....	50,515	.....	51,295	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1893	92,038	53	798	.....	48,431	.....	49,229	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1894	89,337	55	829	.....	49,344	.....	50,173	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1895	103,692	51	726	.....	52,892	.....	53,618	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1896	114,199	53	727	.....	60,960	.....	61,687	.....	.....	.....	.....	.....	.....	47	.....	.....	47
1897	121,993	50	710	.....	60,476	.....	61,186	.....	.....	.....	.....	.....	.....	71	.....	.....	71
1898	124,979	44	758	.....	55,364	.....	56,122	.....	.....	.....	.....	.....	.....	71	.....	.....	71
1899	131,147	44	808	.....	57,071	.....	57,879	.....	.....	.....	.....	.....	.....	89	.....	.....	89
1900	149,137	43	913	.....	63,621	.....	64,534	.....	.....	.....	.....	.....	.....	274	.....	.....	274
1901	167,440	41	757	10	69,389	.....	70,156	.....	.....	.....	.....	.....	.....	275	.....	.....	275
1902	181,809	49	531	40	88,767	.....	89,338	.....	.....	.....	.....	.....	.....	287	.....	.....	287
1903	194,879	52	487	75	100,461	.....	101,023	.....	.....	.....	.....	.....	.....	278	.....	.....	278
1904	217,948	54	553	126	117,081	.....	117,760	.....	.....	.....	.....	.....	.....	290	.....	.....	290
1905	215,091	63	634	251	134,717	.....	135,602	.....	.....	.....	.....	.....	.....	373	.....	.....	373
1906	213,263	59	569	502	126,494	.....	127,565	.....	.....	.....	.....	.....	.....	531	.....	.....	531
1907	263,957	63	789	1,005	166,095	.....	167,889	*	.....	.....	.....	.....	.....	751	.....	.....	751
1908	285,287	63	528	3,933	178,527	.....	182,988	12	.....	.....	.....	.....	.....	945	*	.....	957
1909	298,709	61	421	2,714	183,171	.....	186,306	18	.....	.....	.....	.....	.....	1,411	57	.....	1,486
1910	327,763	64	316	3,634	209,557	.....	213,507	20	.....	.....	.....	.....	.....	1,258	143	.....	1,421
1911	344,361	64	291	12,553	220,449	.....	233,293	13	.....	.....	.....	.....	.....	1,465	285	.....	1,763
1912	352,443	63	243	16,558	222,935	.....	239,736	47	.....	.....	.....	.....	.....	1,752	437	.....	2,236
1913	385,345	54	228	25,696	248,446	.....	274,370	131	.....	.....	.....	.....	.....	2,071	504	.....	2,706
1914	407,544	65	215	26,235	265,763	.....	292,213	276	.....	.....	.....	.....	.....	1,837	644	.....	2,757
1915	432,033	65	215	32,911	281,104	.....	314,230	513	.....	.....	.....	.....	.....	2,579	750	.....	3,842
1916	457,509	66	198	40,546	300,767	.....	341,511	867	.....	.....	.....	.....	.....	2,593	929	.....	4,389
1917	502,891	67	214	55,293	335,316	.....	390,823	1,218	.....	.....	.....	.....	57	2,577	1,602	120	5,574
1918	503,515	71	305	63,828	355,928	.....	420,061	1,353	.....	.....	.....	.....	†60	2,527	2,082	333	6,355
1919	555,875	68	241	87,073	378,367	.....	465,681	1,331	.....	.....	.....	.....	†60	2,628	1,841	425	6,285
1920	688,884	64	196	157,069	442,929	.....	600,194	1,651	.....	.....	.....	.....	†60	2,817	2,083	457	7,068
1921	766,002	62	188	193,398	472,183	.....	665,769	2,036	.....	.....	.....	67	†60	3,699	2,354	1,433	9,649
1922	858,898	65	179	182,278	557,531	.....	739,988	2,866	.....	.....	.....	323	†60	5,314	2,445	2,201	13,209
1923	1,015,736	72	170	149,585	732,407	.....	882,162	3,400	.....	.....	.....	425	87	5,699	3,051	4,201	16,863
1924	1,014,318	70	161	139,678	713,940	.....	853,779	4,639	.....	.....	.....	445	†100	8,379	4,057	9,042	26,662
1925	1,068,933	71	332	115,515	763,743	.....	879,590	6,336	.....	.....	.....	1,007	160	9,232	4,387	19,687	40,809
1926	1,096,823	70	364	90,421	770,874	.....	861,659	7,851	.....	.....	.....	6,444	214	10,762	4,971	36,911	67,153
1927	1,262,582	71	477	64,121	901,129	.....	965,727	8,630	.....	.....	.....	15,014	537	10,127	5,380	63,134	102,822
1928	1,324,774	68	624	50,151	901,474	.....	952,249	9,070	.....	*	.....	19,897	1,084	12,006	7,684	105,749	155,490
1929	1,485,867	68	1,117	44,688	1,007,323	.....	1,053,128	9,391	.....	*	.....	20,385	1,381	13,422	8,716	137,472	190,767
1930	1,410,037	64	1,522	39,530	898,011	.....	939,063	9,002	.....	56	.....	20,346	1,553	12,449	9,419	136,669	189,494
1931	1,372,532	62	1,543	33,039	851,081	.....	885,663	11,709	.....	25	.....	18,237	1,762	10,089	9,744	116,613	168,179
1932	1,309,677	60	1,044	32,805	785,159	.....	819,008	13,139	.....	44	.....	16,414	1,597	9,899	10,126	116,541	167,760
1933	1,442,146	63	1,145	34,001	905,656	23	940,825	13,691	.....	112	.....	13,158	1,620	13,257	9,561	117,720	169,119
1934	1,522,281	60	1,417	38,172	908,065	28	947,682	14,024	.....	159	.....	17,341	1,637	16,314	10,894	136,103	196,472
1935	1,654,488	60	1,447	40,241	996,596	47	1,038,331	14,297	.....	164	.....	17,598	1,732	17,067	11,671	148,254	210,783
1936	1,791,540	61	1,500	41,028	1,099,687	62	1,142,277	15,458	.....	105	.....	18,756	1,942	17,593	13,237	154,794	221,885
1937	2,039,231	63	2,944	46,907	1,279,160	33	1,329,044	16,355	.....	122	.....	20,599	2,161	17,457	15,503	186,230	258,427
1938	1,988,041	61	6,966	38,506	1,214,355	78	1,259,905	17,076	.....	226	.....	21,582	2,246	15,839	17,737	188,174	262,880
1939	2,086,160	60.6	7,838	42,898	1,264,962	112	1,315,810	18,613	.....	215	.....	23,857	2,313	13,508	19,270	206,470	284,246
1940	2,149,821	62.9	8,591	44,036	1,353,214	142	1,405,983	20,609	.....	288	2	25,593	2,349	12,126	22,227	185,570	268,764
1941	2,220,657	63.1	10,134	42,196	1,402,228	150	1,454,708	21,873	.....	235	3	24,553	1,557	11,935	20,506	228,430	308,087
1942	2,093,100	66.2	10,365	34,815	1,386,645	151	1,431,976	23,704	2	308	33	10,487	2,278	13,629	22,069	147,675	220,185
1943	2,256,625	66.7	10,052	35,163	1,505,613	107	1,550,935	27,714	2	334	48	13,261	2,315	14,654	21,385	177,631	257,344
1944	2,592,511	64.7	10,099	38,203	1,677,904	109	1,726,315	24,230	1	314	58	22,291	2,967	14,386	22,139	257,046	343,432
1945	2,594,914	66.0	8,483	43,547	1,713,655	149	1,765,834	22,881	2	382	79	22,449	2,664	13,744	21,093	323,156	406,450
1946	2,746,680	63.1	7,586	49,235	1,733,939	269	1,791,029	20,604	1	363	67	22,518	2,323	12,456	20,173	388,486	466,991
1947	3,022,030	61.4	7,632	56,284	1,856,107	300	1,920,323	21,846	*	375	97	25,882	2,282	12,764	20,521	434,885	518,683
1948‡	3,410,491	59.1	12,361	58,370	2,016,282	112	2,087,125	22,992	*	464	143	24,371	2,611	14,069	20,202	489,985	574,837
Total	58,335,650	63.6	141,144	2,348,863	37,098,791	1,872	39,590,670	411,486	8	4,291	530	443,300	43,829	371,672	371,879	4,521,597	6,168,592

* Less than 1,000 barrels. † Approximate production. ‡ Compiled by WORLD OIL.

World Crude Oil Production, By Countries, By Years (Part 2)

(Complete production history of world, in thousands of barrels of 42 U. S. Gallons. Sources: *Mineral Resources and Minerals Yearbook*, except as otherwise indicated)

	EUROPE													AFRICA			
YEAR	Albania	Austria	Czecho-slovakia	Great Britian	France	Ger-many	Hun-gary	Italy	Nether-lands	Poland	Rou-mania	‡U.S.S.R. (Russia)	Yugo-slavia	‡Total Europe	Egypt	Algeria	Other Africa	Total Africa
1857											2			2				
1858											4			4				
1859											4			4				
1860											9			9				
1861								*			17			17				
1862								*			23			23				
1863								*			28	41		69				
1864								*			33	65		98				
1865								2			39	67		108				
1866								1			42	83		126				
1867								1			51	120		172				
1868								*			56	88		144				
1869								*			59	202		261				
1870								*			84	204		288				
1871								*			90	165		255				
1872								*			91	185		276				
1873								*			104	475		579				
1874								1		150	103	583		837				
1875								1		158	108	697		964				
1876								3		164	111	1,321		1,599				
1877								3		170	108	1,801		2,082				
1878								4		176	109	2,401		2,690				
1879								3		215	110	2,761		3,089				
1880						9		2		229	115	3,001		3,356				
1881						29		1		287	122	3,601		4,040				
1882						58		2		330	136	4,538		5,064				
1883						27		2		365	139	6,002		6,535				
1884						46		3		408	211	10,805		11,473				
1885						41		2		465	193	13,925		14,626				
1886						74		2		306	168	18,006		18,556				
1887						74		1		344	182	18,368		18,969				
1888						85		1		467	219	23,049		23,821				
1889						68		1		515	298	24,609		25,491				
1890						108		3		659	383	28,691		29,844				
1891						109		8		631	488	34,573		35,809				
1892						101		18		646	593	35,775		37,133				
1893						100		19		693	535	40,457		41,804				
1894						123		21		949	508	36,375		37,976				
1895						121		26		1,453	576	46,140		48,316				
1896						145		18		2,444	543	47,221		50,371				
1897						166		14		2,226	571	54,399		57,376				
1898						184		15		2,376	776	61,610		64,961				
1899						192		16		2,314	1,426	65,955		69,903				
1900						358		12		2,347	1,629	75,780		80,126				
1901						314		16		3,251	1,678	85,168		90,427				
1902						354		19		4,142	2,060	80,540		87,115				
1903						446		18		5,235	2,763	75,591		84,053				
1904						637		26		5,947	3,599	78,537		88,746				
1905						561		44		5,766	4,421	54,960		65,752				
1906						579		54		5,468	6,378	58,897		71,376				
1907						757		60		8,456	8,118	61,851		79,242				
1908						1,009		51		12,612	8,252	62,187		84,111				
1909						1,019		42		14,933	9,327	65,970		91,291				
1910						1,032		51		12,673	9,724	70,337		93,817				
1911						1,017		75		10,519	11,108	66,184		88,903	21			21
1912						1,031		54		8,535	12,976	68,019		90,615	214			214
1913						857		47		7,818	13,555	62,834		85,111	98			98
1914						781		40		6,436	12,827	67,020		87,104	753	1		754
1915						703		44		5,352	12,030	68,548		86,677	212	4		216
1916						656		51		6,587	8,945	65,817		82,056	404	8		412
1917					§	642		41		6,228	3,721	63,072		73,704	943	9		952
1918					363	270		35		6,032	8,730	27,168		42,598	1,935	7		1,942
1919			48	2	334	265		35		6,096	6,618	31,752		45,150	1,517	5		1,522
1920			69	3	356	246		35		5,607	7,435	25,430		39,181	1,042	4		1,046
1921			94	3	389	274		32		5,167	8,368	28,968		43,295	1,255	3		1,258
1922			120	1	496	319		31		5,227	9,843	35,692		51,729	1,188	9		1,197
1923			74	1	494	346		34		5,402	10,867	39,147		56,365	1,054	9		1,063
1924			76	2	497	406		39		5,657	13,369	45,355		65,401	1,122	11		1,133
1925			158	3	459	541		61		5,960	16,650	52,448		76,280	1,226	12		1,238
1926			150	2	478	653		41		5,844	23,314	64,311		94,793	1,188	9		1,197
1927			112	2	504	663		47		5,342	26,368	77,018		110,056	1,267	8		1,275
1928			94	1	512	630		46		5,492	30,773	†84,745		122,293	1,842	8		1,850
1929			93		535	704		45		4,988	34,758	†99,507		140,630	1,868	20		1,888
1930			157	*	523	1,182		59		4,904	41,624	†125,555		174,004	1,996	16		2,012
1931			134	*	520	1,606		124		4,662	49,127	162,842		219,015	2,038	*		2,038
1932			126	*	530	1,608		208		4,116	53,815	154,367		214,770	1,895	*		1,895
1933	11		122	*	562	1,665		204		4,072	54,020	154,840		215,496	1,663	*		1,663
1934	10		178	*	557	2,187		151		3,913	62,063	174,318		243,377	1,546	*		1,546
1935	41	44	133	*	541	2,996		119		3,812	61,310	182,386	2	251,384	1,301	*	4	1,305
1936	273	50	127	*	503	3,115		123		3,789	63,659	186,206	1	257,846	1,278	*	4	1,282
1937	619	221	123	*	502	3,176	16	110		3,716	52,452	193,241	4	254,180	1,196	*	22	1,218
1938	752	383	130	*	513	3,861	288	101		3,763	48,487	204,956	9	263,243	1,581	*	27	1,608
1939	934	1,240	120		500	4,487	1,103	91		3,898	45,648	216,866	10	274,897	4,666	*	27	4,693
1940	1,497	2,808	163	124	496	7,371	1,881	85		3,891	43,168	218,600	10	280,094	6,505	*	27	6,532
1941	1,334	4,238	183	223	414	6,303	3,183	95		1,793	40,517	238,150	10	296,443	8,546	*	27	8,573
1942	1,601	5,899	271	605	463	5,191	5,037	101		2,794	42,094	227,470	10	291,536	8,275	*	41	8,316
1943	1,001	7,478	200	839	356	4,973	6,347	75		3,500	39,182	200,750	10	264,711	8,953	*	39	8,992
1944	334	8,218	185	703	300	6,154	6,204	75	14	3,000	26,191	275,000	500	326,878	9,416	*	32	9,448
1945	267	3,074	91	532	197	3,935	5,018	75	41	750	34,772	148,953	450	198,155	9,406	*	26	9,432
1946	1,000	5,734	196	412	367	4,539	5,146	82	435	866	31,434	157,673	400	208,284	9,070	*	20	9,090
1947	1,800	6,285	210	351	363	4,035	4,330	80	1,478	951	28,552	187,463	365	236,263	8,627	*	23	8,650
1948‡	358	5,711	187	323	362	4,447	3,581	65	3,444	989	29,500	207,850	366	257,183	13,173	*	96	13,269
Total	11,832	51,383	4,124	4,132	13,986	92,761	42,134	3,443	5,412	277,438	1,187,386	6,048,698	2,147	7,744,876	120,280	143	415	120,838

‡ Includes field in Russian Asia other than Sakhalin. * Less than 1,000 barrels. ★ No more data available. § France's earlier production credited to Germany. † Year ended September 30. ‡ Compiled by WORLD OIL.

World Crude Oil Production, By Countries, By Years (Part 3)

(Complete production history of world, in thousands of barrels of 42 U. S. Gallons. Sources: *Mineral Resources and Minerals Yearbook*, except as otherwise indicated)

	ASIA—Middle East						ASIA—Far East											
Year	Bahrein	Iran	Iraq	Kuwait	Saudi Arabia	Total Middle East	British Borneo	‡India	‡Burma	China	¶ Formosa (Taiwan)	Japan	Netherland India	Sakhalin	Total Far East	*Total Asia	Australia-New Zealand	Rest of World
1857	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1858	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1859	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1860	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1861	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1862	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1863	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1864	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1865	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1866	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1867	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1868	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1869	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1870	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1871	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1872	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1873	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1874	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1875	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	.....	.....	5	5	.....	.....
1876	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	7	.....	.....	7	7	.....	.....
1877	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	10	.....	.....	10	10	.....	.....
1878	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18	.....	.....	18	18	.....	.....
1879	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	23	.....	.....	23	23	.....	.....
1880	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	26	.....	.....	26	26	.....	.....
1881	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	17	.....	.....	17	17	.....	.....
1882	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	15	.....	.....	15	15	.....	.....
1883	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	20	.....	.....	20	20	.....	.....
1884	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	28	.....	.....	28	28	.....	.....
1885	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	30	.....	.....	30	30	.....	.....
1886	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	38	.....	.....	38	38	.....	.....
1887	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	29	.....	.....	29	29	.....	.....
1888	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	37	.....	.....	37	37	.....	.....
1889	.....	.....	.....	.....	.....	.....	.....	94	.....	.....	.....	53	.....	.....	147	147	.....	.....
1890	.....	.....	.....	.....	.....	.....	.....	118	.....	.....	.....	52	.....	.....	170	170	.....	.....
1891	.....	.....	.....	.....	.....	.....	.....	190	.....	.....	.....	53	.....	.....	243	243	.....	.....
1892	.....	.....	.....	.....	.....	.....	.....	242	.....	.....	.....	69	.....	.....	311	311	.....	.....
1893	.....	.....	.....	.....	.....	.....	.....	299	.....	.....	.....	106	600	.....	1,005	1,005	.....	.....
1894	.....	.....	.....	.....	.....	.....	.....	327	.....	.....	.....	173	688	.....	1,188	1,188	.....	.....
1895	.....	.....	.....	.....	.....	.....	.....	372	.....	.....	.....	170	1,216	.....	1,758	1,758	.....	.....
1896	.....	.....	.....	.....	.....	.....	.....	430	.....	.....	.....	237	1,427	.....	2,094	2,094	.....	.....
1897	.....	.....	.....	.....	.....	.....	.....	546	.....	.....	.....	262	2,552	.....	3,360	3,360	.....	.....
1898	.....	.....	.....	.....	.....	.....	.....	542	.....	.....	.....	319	2,964	.....	3,825	3,825	.....	.....
1899	.....	.....	.....	.....	.....	.....	.....	941	.....	.....	.....	539	1,796	.....	3,276	3,276	.....	.....
1900	.....	.....	.....	.....	.....	.....	.....	1,079	.....	.....	.....	871	2,253	.....	4,203	4,203	.....	.....
1901	.....	.....	.....	.....	.....	.....	.....	1,431	.....	.....	.....	1,117	4,014	.....	6,562	6,562	.....	20
1902	.....	.....	.....	.....	.....	.....	.....	1,617	.....	.....	.....	996	2,430	.....	5,043	5,043	.....	26
1903	.....	.....	.....	.....	.....	.....	.....	2,510	.....	.....	.....	1,200	5,770	.....	9,489	9,489	.....	36
1904	.....	.....	.....	.....	.....	.....	.....	3,385	.....	.....	.....	1,219	6,508	.....	11,112	11,112	.....	40
1905	.....	.....	.....	.....	.....	.....	.....	4,137	.....	.....	.....	1,347	7,850	.....	13,334	13,334	.....	30
1906	.....	.....	.....	.....	.....	.....	.....	4,016	.....	.....	.....	1,564	8,181	.....	13,761	13,761	.....	30
1907	.....	.....	.....	.....	.....	.....	.....	4,344	.....	.....	.....	1,718	9,983	.....	16,045	16,045	.....	30
1908	.....	.....	.....	.....	.....	.....	.....	5,047	.....	.....	.....	1,871	10,283	.....	17,201	17,201	.....	30
1909	.....	.....	.....	.....	.....	.....	.....	6,677	.....	.....	.....	1,887	11,042	.....	19,606	19,606	.....	20
1910	.....	.....	.....	.....	.....	.....	.....	6,138	.....	.....	.....	1,829	11,031	.....	18,998	18,998	.....	20
1911	.....	.....	.....	.....	.....	.....	.....	6,451	.....	.....	.....	1,737	12,173	.....	20,361	20,361	.....	20
1912	.....	.....	.....	.....	.....	.....	.....	7,117	.....	.....	.....	1,659	10,846	.....	19,622	19,622	.....	20
1913	.....	1,857	.....	.....	.....	1,857	141	7,930	.....	.....	.....	1,940	11,172	.....	21,183	23,040	.....	20
1914	.....	2,910	.....	.....	.....	2,910	318	7,410	.....	.....	.....	2,636	11,422	.....	21,786	24,696	.....	20
1915	.....	3,616	.....	.....	.....	3,616	392	8,202	.....	.....	.....	2,928	11,920	.....	23,442	27,058	.....	10
1916	.....	4,477	.....	.....	.....	4,477	629	8,491	.....	.....	.....	2,963	12,547	.....	24,630	29,107	.....	25
1917	.....	7,147	.....	.....	.....	7,147	542	8,079	.....	.....	.....	2,861	13,180	.....	24,662	31,809	.....	29
1918	.....	8,623	.....	.....	.....	8,623	504	8,188	.....	.....	.....	2,441	12,778	.....	23,911	32,534	.....	25
1919	.....	10,139	.....	.....	.....	10,139	596	8,736	.....	.....	.....	2,238	15,508	.....	27,078	37,217	.....	20
1920	.....	12,230	.....	.....	.....	12,230	1,020	8,375	.....	.....	.....	2,221	17,529	.....	29,145	41,375	.....	20
1921	.....	16,673	.....	.....	.....	16,673	1,411	8,734	.....	.....	.....	2,233	16,958	2	29,338	46,011	.....	20
1922	.....	22,247	.....	.....	.....	22,247	2,849	8,529	.....	.....	.....	2,055	17,066	7	30,506	52,753	.....	22
1923	.....	25,230	.....	.....	.....	25,230	3,940	8,406	.....	.....	.....	1,804	19,870	9	34,029	59,259	.....	24
1924	.....	32,373	.....	.....	.....	32,373	4,163	8,416	.....	.....	.....	1,814	20,473	80	34,946	67,319	.....	24
1925	.....	35,038	.....	.....	.....	35,038	4,257	8,274	.....	.....	.....	1,915	21,422	87	35,955	70,993	.....	23
1926	.....	35,842	.....	.....	.....	35,842	4,942	8,011	.....	.....	.....	1,785	21,243	181	36,162	72,004	.....	17
1927	.....	39,688	338	.....	.....	40,026	4,943	8,032	.....	.....	.....	1,789	27,459	440	42,663	82,689	.....	13
1928	.....	43,461	713	.....	.....	44,174	§5,223	8,741	.....	.....	.....	1,944	32,118	677	48,703	92,877	.....	15
1929	.....	42,145	798	.....	.....	42,943	5,290	8,747	.....	.....	.....	2,023	39,279	‡1,134	56,473	99,416	.....	38
1930	.....	45,828	913	.....	.....	46,741	4,907	8,292	.....	.....	.....	1,950	41,729	‡1,805	58,683	105,424	.....	40
1931	.....	44,376	830	.....	.....	45,206	3,854	8,200	.....	.....	.....	2,050	35,539	2,734	52,377	97,583	.....	54
1932	.....	49,471	836	.....	.....	50,307	3,796	8,817	.....	.....	.....	1,630	39,001	2,631	55,875	106,182	.....	62
1933	31	54,392	917	.....	.....	55,340	4,490	8,743	.....	.....	.....	1,455	42,606	2,338	59,632	114,972	.....	71
1934	285	57,851	7,689	.....	.....	65,825	5,140	10,503	.....	.....	.....	1,834	46,925	2,881	67,283	133,108	.....	96
1935	1,265	57,273	27,408	.....	.....	85,946	5,546	2,038	7,181	.....	.....	2,249	47,171	2,545	66,730	152,676	5	4
1936	4,645	62,718	30,406	.....	20	97,789	5,209	1,978	7,588	.....	.....	2,440	50,025	3,212	70,452	168,241	5	4
1937	7,762	77,804	31,836	.....	65	117,467	6,009	2,162	7,848	.....	.....	2,488	56,724	3,656	78,887	196,354	4	4
1938	8,298	78,372	32,643	.....	495	119,808	6,913	2,488	7,538	.....	.....	2,511	57,318	†3,821	80,589	200,397	4	4
1939	7,589	78,151	30,791	.....	3,934	120,465	7,097	2,327	7,873	4	.....	2,654	62,087	4,000	86,042	206,507	3	4
1940	7,074	66,317	24,225	.....	5,075	102,691	7,047	2,302	7,731	10	.....	2,639	62,011	4,000	85,740	188,431	3	14
1941	6,794	,777	12,650	.....	4,310	74,531	6,864	2,899	7,762	87	62	1,929	53,704	4,000	77,307	151,338	3	.....
1942	6,241	,256	19,726	.....	4,530	102,753	3,000	2,792	2,500	340	48	1,652	24,000	4,000	38,332	141,085	2	.....
1943	6,572	4,612	24,848	.....	4,868	110,900	4,500	2,735	1,000	447	38	1,727	48,294	5,000	63,741	174,641	2	.....
1944	6,714	102,045	30,943	.....	7,794	147,496	6,000	2,784	750	505	40	1,601	22,260	5,000	38,940	186,436	2	.....
1945	7,309	130,526	35,112	.....	21,311	194,258	2,100	2,343	725	484	11	1,519	7,600	6,000	20,782	215,040	3	.....
1946	8,010	146,819	35,665	5,931	59,944	256,369	2,050	2,193	700	513	16	1,343	2,100	6,000	14,915	271,284	2	.....
1947	9,411	154,511	35,834	16,225	89,852	305,833	12,970	1,863	800	378	18	1,258	8,020	7,000	32,307	338,140	2	.....
1948‡	10,915	190,395	26,466	46,547	142,853	417,201[1]	18,588	2,490	300	532	17	1,291	31,906	5,750	60,874	478,075	2	.....
Total	98,915	1,938,190	411,587	68,703	345,051	2,862,471	157,240	337,596		3,300	250	95,170	1,174,571	78,990	1,847,117	4,709,588	42	1,044

‡ Separation of British India and Burma prior to 1935 not available from U. S. Bureau of Mines data here used. Data by L. Dudley Stamp in "Petroleum Development and Technology, 1933," and in A.I.M.E. "Transactions" indicate cumulatives through 1934 as follows: Burma 184,528, India 20,756. * Exclusive of U.S.S.R. fields in Asia, other than Sakhalin, which are included with U.S.S.R. in Europe. ‡ Year ended September 30. † Approximate production § Beginning of production in Brunei. ¶ Formosa included with Japan prior to 1941. ‡ Compiled by WORLD OIL. [1] Includes 25,000 barrels produced in Turkey during 1948.

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WORLD COMPLETIONS and FOOTAGE

THE rapidly mounting demand for crude petroleum which has been the trend for the past few years continued into 1948 and was reflected in an increase of nearly 10 percent in the volume of drilling outside the U. S. The year just past saw drilling equipment and materials available in sufficient quantities for all necessary operations, with the result that 3113 wells were drilled outside the U. S. compared to 2898 wells in 1947. Total world completions amounted to 42,467 wells, of which 39,354, or 92.6 percent were drilled in the U. S.

As has been the case in past years, the per-well footage indicates the trend toward deeper operations. While the increase in number of wells outside the United States was less than 10 percent the increase in footage drilled amounted to 14.7 percent. In 1948 there were 11,362,311 feet of hole represented by the 3113 completions, while 1947 footage totaled 9,910,365 feet.

With the rapid increase in Canadian operations and the all-time peak reached in Venezuela, the Western Hemisphere occupied a still greater position in foreign drilling in 1948. The 2200 wells drilled in North and South America, exclusive of the U. S., represented more than 70.6 percent of all foreign drilling (excluding Russia and some of its satellites). Venezuela and Canada alone accounted for more than half of such drilling.

The most outstanding increase took place in Canada as a result of the boom set off by discovery of Leduc field in 1947 and other important discoveries, including Redwater, in 1948. The year saw 818 wells completed, compared with 682 in 1947, and all indications point to a still greater increase in 1949. At the close of the year 85 rigs were running in Alberta alone, and early in 1949 there were more than 100 at work with possibility that the exploratory activity will move over into Saskatchewan before the end of the year. Although Venezuela is still leading foreign countries with 889 completions, it is more than likely that Canada will drill more wells in 1949, since decreased demand for heavy Venezuela crudes has caused cut-backs in drilling operations. At the close of the year there were 152 rigs running in Venezuela but sharp cuts were being made during the first few months of 1949. Meanwhile Canada's activity is still on the upswing.

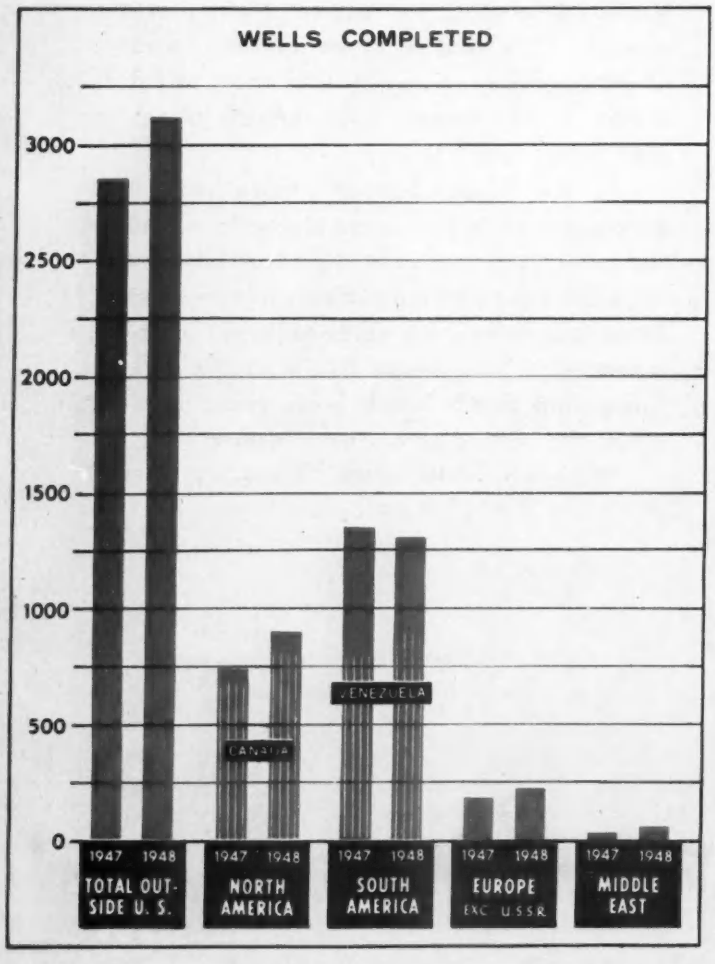
South America as a whole saw a decrease both in number of wells and footage drilled, with sharp drops in activity in Argentina and Colombia and a smaller decrease in Brazil.

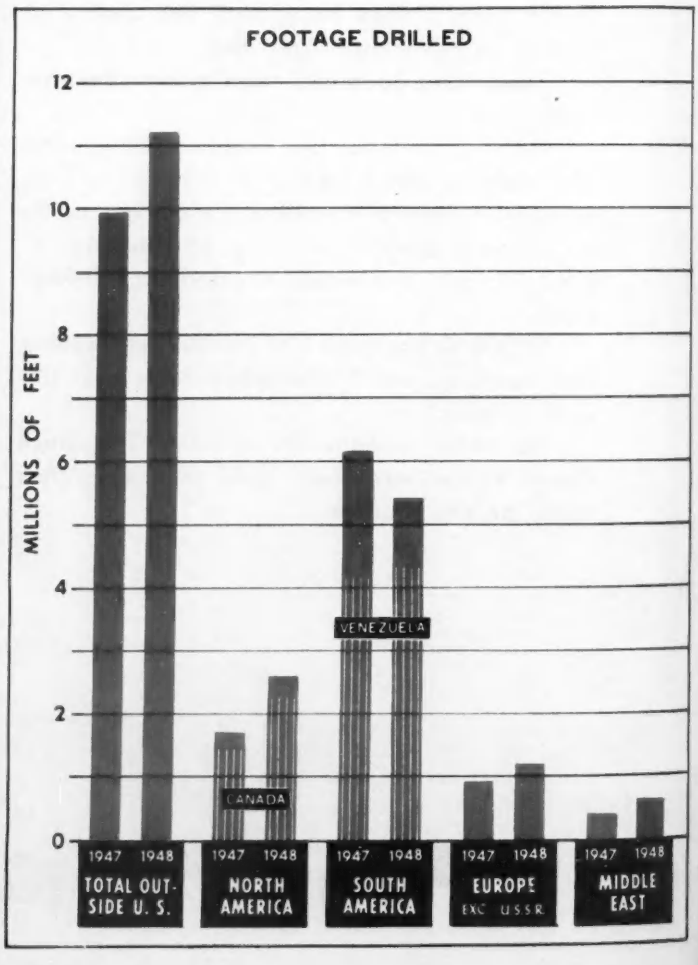
Percentagewise the greatest foreign increase came in the Middle East region where 43.8 percent more wells were drilled than were drilled in 1947, but numerically this is still a relatively small portion of the world's drilling, since only 69 wells were drilled in all the Middle East countries. The caliber of wells there is such that few new wells are required to maintain the enormous potential of the fields.

The establishment of order in Sumatra allowed readier access to most of its fields during the past year with the result that the Netherlands East Indies drilling total came to 186 wells, a new post-war peak, and an increase of nearly 39 percent over 1947.

Drilling operations in Europe (excluding U.S.S.R. and its satellites) totaled 435 completions in 1948 as compared with 371 in 1947. The increase was due to enlarged activity in Germany, France and The Netherlands. Germany showed a large gain in completing 185 wells as compared with 99 in 1947. Completions in France totaled 63 against 54 in 1947, and The Netherlands completed 41 wells in contrast with 17.

Drilling Activity Outside of United States in 1947-1948





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WORLD COMPLETIONS and FOOTAGE—Continued

Drilling Activity in 1947 and 1948 by Countries

COUNTRY	Total Wells Completed in 1947	Footage Drilled in 1947 Completions	Wells Drilling End of 1948	WELLS COMPLETED IN 1948					Wells Drilling or Shut Down End of 1948
				Oil	Gas	Dry	Total Wells	Total Footage	
NORTH AMERICA EXCEPT UNITED STATES:									
Alaska	1	6,212	1	.....	.....	1	1	7,000	.....
Canada	682	1,470,855	38	274	211	333	818	2,225,616	85[1]
Mexico	51	286,723	25	40	3	37	80	420,905	35
Total North America Except United States	734	1,763,790	64	314	214	371	899	2,653,521	120
WEST INDIES:									
Bahama Islands	1	14,587	.....	.....	.....	.....	.....	.....	.....
Cuba	3	16,032	.....	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Dominican Republic	.....	.....	.....	.....	.....	.....	.....	.....	.....
Haiti	.....	.....	.....	.....	.....	.....	.....	.....	.....
Trinidad	142	281,228	24	128	.....	6	134	553,822	25
Total West Indies	146	311,847	24	128	.....	6	134	553,822	25
CENTRAL AMERICA:									
Nicaragua	.....	.....	1	.....	.....	1	1	6,297	.....
Panama	.....	.....	1	.....	.....	1	1	8,000	1
SOUTH AMERICA:									
Argentina	208	774,396	n.a.	58	4	12	74	238,050	16
Bolivia	6	15,844	14	4	.....	2	6	14,983	21
Brazil	26	71,519	5	14	.....	1	15	38,438	17
Chile	6	44,906	2	3	3	.....	6	45,000	2
Colombia	162	627,829	30	51	1	20	72	413,833	21
Ecuador	n.a.	n.a.	n.a.	53	.....	10	63	105,184	n.a.
Paraguay	1	7,579	1	.....	.....	1	1	10,331	1
Peru	156	450,743	36	127	5	43	175	516,722	39
Venezuela	787	4,161,081	134	793	7	89	889	4,349,108	152
Total South America	1,352	6,153,897	222	1,103	20	178	1,301	5,731,649	269
EUROPE:									
Albania	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Austria	5	n.a.	n.a.	n.a.	n.a.	n.a.	40	n.a.	30
Czechoslovakia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Denmark	1	7,985	1	.....	.....	.....	.....	.....	1
France	54	144,540	37	14	1	48	63	234,850	17
Germany	99	235,518	28	99	.....	86	185	553,068	45
Great Britain	12	33,203	12	2	1	5	8	21,397	2
Hungary	24	106,393	11	15	4	9	28	89,151	7
Italy	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Netherlands	17	56,902	6	40	.....	1	41	118,720	1
Poland	95	106,489	n.a.	n.a.	n.a.	n.a.	69[2]	100,220[2]	n.a.
Portugal	.....	.....	.....	n.a.	n.a.	n.a.	n.a.	n.a.	1
Roumania	64	275,832	40	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Spain	.....	.....	1	.....	.....	1	1	8,200	3
Sweden	.....	.....	.....	.....	.....	.....	.....	.....	.....
U.S.S.R. (incl. Sakhalin)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Yugoslavia	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Total Europe	371	966,862	136	170	6	150	435	1,125,606	107
AFRICA:									
Algeria	13[3]	14,685	5	.....	.....	6	6	29,200	4
Egypt	15	70,370	7	12	.....	8	20	78,876	6
Morocco	34	67,840	6	3	.....	54	57	174,450	7
Other Africa	.....	.....	.....	.....	.....	2	2	13,100	2
Total Africa	62	152,895	18	15	.....	70	85	295,626	19
MIDDLE EAST:									
Bahrein Island	6	13,660	1	.....	.....	.....	.....	.....	1
Iran	5	32,144	5	6	.....	.....	6	35,608	5
Iraq	8	19,967	3	3	2	2	10[4]	39,232	9
Kuwait	5	23,818	5	24	.....	.....	24	116,112	9
Lebanon	.....	.....	1	.....	.....	1	1	10,059	.....
Palestine	.....	.....	1	.....	.....	.....	.....	.....	1
Qatar	.....	.....	1	3	.....	.....	3	16,200	1
Saudi Arabia	24	143,224	7	24	.....	.....	24	157,363	7
Syria	.....	.....	2	.....	.....	1	1	8,666	2
Turkey	.....	.....	1	.....	.....	.....	.....	.....	2
Total Middle East	48	232,813	27	60	2	4	69	383,240	37
FAR EAST:									
British East Indies (Brunei & Sarawak)	22	91,799	42	17	1	.....	18	98,556	8
Burma	.....	.....	.....	.....	.....	.....	.....	.....	.....
China (incl. Formosa)	6	n.a.	3	7	.....	.....	7	n.a.	3
India and Pakistan	n.a.	n.a.	12	n.a.	n.a.	n.a.	n.a.	n.a.	5
Japan	59	144,030	24	26	3	27	56	108,370	15
Netherland East Indies	46	75,182	7	85	1	17	103	378,015	32
Philippines	1	9,950	1	.....	.....	2	2	3,732	1
Total Far East	134	320,961	89	135	5	46	186	588,673	64
OCEANIA:									
Australia	1	7,300	2	.....	.....	1	1	3,256	1
New Zealand	.....	.....	.....	.....	.....	.....	.....	.....	.....
Papua	.....	.....	1	.....	.....	1	1	12,621	2
Total Oceania	1	7,300	3	.....	.....	2	2	15,877	3
Total Outside United States	2,848	9,910,365	585	1,925	247	829	3,113	11,362,311	645
UNITED STATES[5]	33,798	113,279,446	4,945	22,128	3,044	11,522	39,354	135,098,504	4,909
WORLD TOTAL	36,646	123,189,811	5,530	24,053	3,291	12,351	42,467	146,460,815	5,554

[1] Alberta only. [2] January to June. [3] Includes 8 core tests. [4] Includes 3 observation wells.
[5] U.S. total includes input wells, disposal wells, and old wells drilled deeper, which totaled 2,714 in 1947 and 2,660 in 1948.

PAGE *Advanced design* TOOLS are setting new production records

PAGE TENSION TOOLS

1 2 3 4 5 6 7

1 TYPE "B" TUBING ANCHOR FOR ROD PUMP TUBING STRINGS— Page Type "B" Tubing Anchors set hydrostatically as well pumps up! Cup-sealed pistons, actuated by the hydrostatic head of fluid in the tubing string, force and hold V-cut slip segments against the casing wall. Field records prove the Type "B" Anchor keeps tubing in the hole longer!

2 TYPE "C" TUBING ANCHOR FOR MAIN AND PARALLEL STRINGS— Page Type "C" Tubing Anchors are designed specifically to anchor *both* main and parallel tubing strings in "Free Pump" installations. The Type "C" incorporates the same successful hydrostatic setting principle as the Type "B" Tubing Anchor and is earning the same record of cutting production costs.

3 TYPE "A" TUBING DRAIN AND TUBING BUMPER SUB— The Type "A" Tubing Drain is a combination tool that permits drainage of tubing by simple top-hole manipulation of the tubing string and a means of up-jarring tubing strings stuck by corrosion and scale. Draining of tubing requires only a ¼ turn right and slight pick up on the tubing string.

4 TYPE "B" TUBING DRAIN WITH BLOW-OUT PLUG— The Page Type "B" Tubing Drain incorporates an "O" ring sealed plug held in position by a shearable pin. Tubing is drained by introducing hand pump pressure at the well head. Various Diameter shearable pins are provided so that the operator can determine proper pin for his particular well.

5 SUCKER ROD ON & OFF ATTACHMENT—The Page Sucker Rod On & Off Attachments provides a quick, effective means of joining sucker rods to pump plunger in tubing and casing pump installations. It features a foolproof clutch-type locking mechanism and mandrel-in-socket arrangement that eliminates chance for failure.

6 ROTATING BOTTOM HOLE PACKER— The Page Rotating Bottom Hole Packer is free to turn while being run in the hole which reduces wear on the packer cups. It is furnished with one or two unitized packer cup assemblies and can quickly and easily run in the well with either end up. Tubing can be rotated without breaking seal.

7 BOTTOM HOLE OIL & GAS SEPARATOR—Designed for use in high oil-gas ratio wells. Permits unrestricted oil and gas separation while pump is fully submerged. Bottom lock pumps anchor in the bowl proper, top lock pumps can be run one or more joints above the bowl. Inside bowl thread and lower coupling thread are API upset tubing size.

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For complete details see Composite Catalog

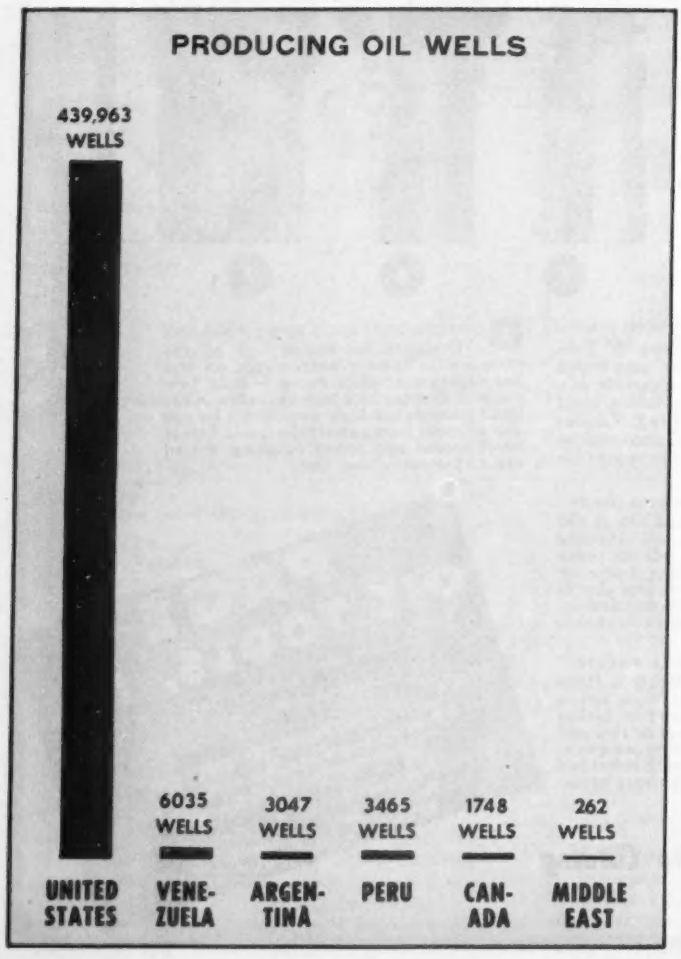
WORLD PRODUCING WELLS

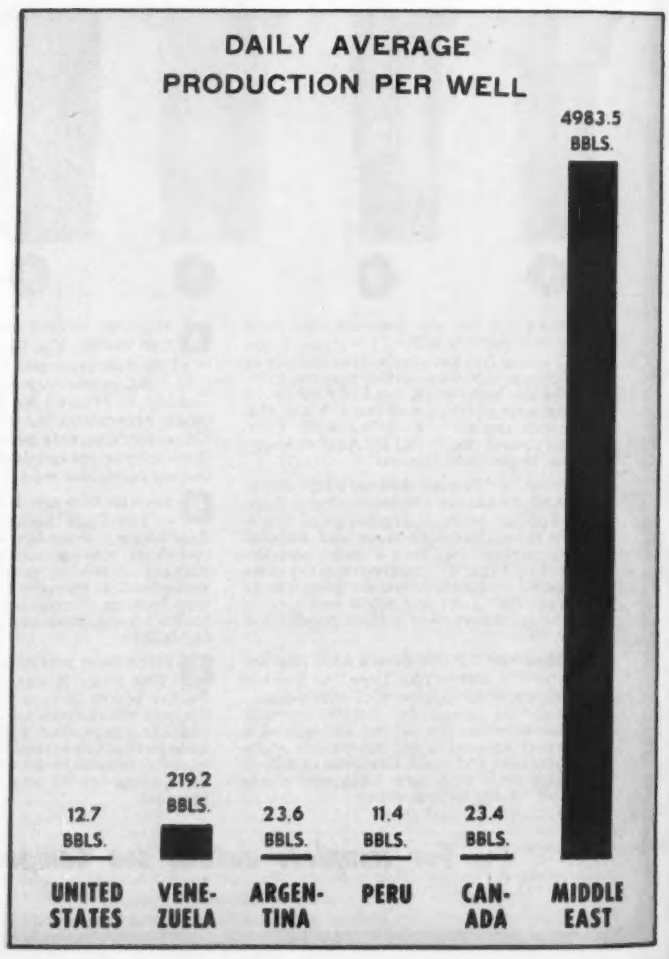
The number of producing oil wells in the world's fields increased by 12,757 during 1948, with most of the increase accounted for by the additional wells that went on production in the United States. At the close of the year there were a total of 470,883 producing wells in the world, based on best available information and excluding Russia and its satellites. Most of these are in the U. S. where 439,963 wells were on production at the end of the year. Although the U. S. showed a sharp gain in the amount of wells drilled, there was very little change in the number of wells flowing naturally, and the larger increase was in wells produced by pumping or other means of artificial lift. Only 49,720, or 11.3 percent of all producers in the U. S. are flowing wells. At the end of the year, with daily production at 5,675,523 barrels, the nation's wells averaged 12.9 barrels per day each. This compares with 12.3 barrels a year ago and 11.1 barrels two years ago. The average is almost certain to drop in 1949 since production rates were lowered early in the year as storage was raised to higher levels.

Outside the U. S. per-well yields were somewhat larger, the overall average being brought up to 129.7 barrels daily per well largely because of the high output maintained in the Middle East fields, and the world average at the end of the year was 20.6 barrels per well. This compares appreciably higher than the average of 18.9 barrels per well at the end of 1947. The averages quoted for the world and for some regions such as Europe and Asia are given as bases for comparison rather than as true averages, since it may be seen from the accompanying table that although actual figures or close estimates of production could be obtained on some of the Eastern European countries, it was not always possible to get such figures on producing wells. Since this was true for both 1947 and 1948 the overall figure does furnish a basis of comparison.

The outstanding increases in production from the Middle East have been made possible by the enormous potential of this region's producing wells. Although it received the smallest amount of drilling during the past year of any of the principal oil regions of the world, the oil production was steadily increased as loading and transportation facilities were expanded until at the end of the year it was making 1,305,757 barrels daily, although only 54 new wells were placed on production. This output was obtained from 265 wells, an average of 4927.4 barrels per day per well. At the end of 1947 the area was producing 958,402 barrels daily from 211 wells, or 4542.2 barrels per well. The increase would have been even greater but for the political disturbances in Palestine which forced closing in of part of Iraq's output. At the end of the year it was making 3858.7 barrels per well whereas at the beginning of the year its average was 9140.2 barrels a day with both legs of its pipe line available. This might well be even higher in 1949 since it is anticipated that its new 16-inch system from Kirkuk to the Mediterranean will be completed by the end of the year. Kuwait has boosted its average from 4769.2 to 5729.7 barrels per well during the course of the year, and this represents a huge increase in actual output. At the end of 1948 it had increased from 62,000 barrels daily from 13 wells, to 212,000 barrels a day from 37 wells. Saudi Arabia, although it added only 17 producing wells, was able to produce substantially more oil as additional pipe lines were built from Abqaiq field to the Persian Gulf, and at the end of the year the per-well average was

Producing Oil Wells and Daily Output of Principal Areas, End of 1948





WORLD PRODUCING WELLS—Continued

6662.9 barrels. This had already been exceeded within the first months of 1949. Iran, still the greatest Middle East producer, had 77 wells at the end of the year flowing 551,000 barrels daily for a per-well average of 7155.8 barrels, compared with 6647.8 barrels a year ago.

The Far East, although its production at the end of 1948 had been raised to a level nearly 30 percent higher than at the beginning of the year, showed a slight drop in per-well yields as drilling increased more rapidly than the available outlet for oil. British Borneo wells produced at an average of 244.4 barrels per day, compared to 255.3 barrels each a year ago, and the Netherlands East Indies wells averaged 74.9 barrels each, compared with 77.9 barrels in 1947.

In the Western Hemisphere Venezuela continued as the best per-well producer with an average of 219.2 barrels per well, although 357 more wells were producing than a year ago when the average was 219.7 barrels. Mexico was second in this respect with an average of 153.2 barrels compared with 156.9 barrels at the end of 1947.

Canada's position has improved materially during the past year with development of new flush areas in Alberta. There were 1748 wells on production, yielding 23.4 barrels each, whereas at the start of 1948 there were 1622 wells averaging 15.4 barrels.

Producing Oil Wells and Daily Production, 1947 and 1948, by Countries

COUNTRY	Total Producing Oil Wells End of 1947	Daily Average Production End of 1947	PRODUCING WELLS AND THEIR OUTPUT AT END OF 1948				
			Flowing	Artificial Lift	Total Producing	Daily Average Production	Barrels Daily Per Well
NORTH AMERICA Except United States:							
Canada	1,622	24,994	n.a.	n.a.	1,748	40,907	23.4
Mexico	977	153,372	n.a.	n.a.	1,052	161,134	153.2
Total North American Outside United States	2,599	178,366	n.a.	n.a.	2,800	202,041	
WEST INDIES:							
Cuba	n.a.	767	n.a.	n.a.	n.a.	306	n.a.
Trinidad	1,934	56,931	669	1,479	2,148	55,921	26
Total West Indies	1,934	57,698	669	1,479	2,148	56,227	
SOUTH AMERICA:							
Argentina	3,046	60,523	69	2,978	3,047	71,765	23.6
Bolivia	25	1,119	14	15	29	1,267	43.7
Brazil	60	335	20	51	71	478	6.7
Chile	.....	Shut In	.....	.....	.....	Shut In	.....
Colombia	987	75,387	137	1,028	1,165	81,453	69.9
Ecuador	718	6,358	n.a.	n.a.	771	7,133	9.3
Peru	3,369	35,921	269	3,196	3,465	39,394	11.4
Venezuela	5,678	1,247,533	2,641	3,394	6,035	1,322,817	219.2
Total South America	13,883	1,427,176	3,150	10,662	14,583	1,524,307	
EUROPE:							
Albania	n.a.	1,000	n.a.	n.a.	n.a.	978	n.a.
Austria	546	18,311	n.a.	n.a.	647	15,604	24.1
Czechoslovakia	n.a.	670	n.a.	n.a.	n.a.	511	n.a.
France	705	576	2	665	667	1,020	1.5
Germany	1,618	11,466	114	1,469	1,583	13,270	8.4
Great Britain	244	900	2	240	242	923	3.8
Hungary	168	10,498	106	76	182	9,495	52.2
Italy	n.a.	220	n.a.	n.a.	n.a.	177	n.a.
Netherlands	31	6,098	1	76	77	11,360	147.5
Poland	2,411	2,801	n.a.	n.a.	2,468*	2,714*	1.1
Roumania	n.a.	78,555	n.a.	n.a.	n.a.	80,601	n.a.
U.S.S.R. (incl. Sakhalin)	n.a.	517,808†	n.a.	n.a.	n.a.	583,606†	n.a.
Yugoslavia	n.a.	1,000†	n.a.	n.a.	n.a.	1,100†	n.a.
Total Europe	5,723	649,903	225	2,526	5,866	721,359	
AFRICA:							
Algeria	5	2	.....	5	5	2	0.4
Egypt	148	35,260	24	105	129	42,508	329.5
Morocco	61	151	4	21	25	276	11.0
Total Africa	214	35,413	28	131	159	42,786	
MIDDLE EAST:							
Bahrein Island	64	28,000	66	.....	66	29,984	454.3
Iran	71	472,000	77	.....	77	551,000	7,155.8
Iraq	10	91,402	12	.....	12	46,304	3,858.7
Kuwait	13	62,000	37	.....	37	212,000	5,729.7
Qatar	.....	Shut In	.....	.....	.....	Shut In	.....
Saudi Arabia	53	305,000	70	.....	70	466,400	6,662.9
Turkey	.....	.....	.....	3	3	69	23.0
Total Middle East	211	958,402	262	3	265	1,305,757	
FAR EAST:							
British East Indies (Sarawak and Brunei)	197	50,300	59	195	254	62,090	244.4
Burma	n.a.	548	n.a.	n.a.	n.a.	820	n.a.
China and Formosa	15	1,034	19	.....	19	1,500	78.9
India and Pakistan	n.a.	6,012	n.a.	n.a.	n.a.	6,803	n.a.
Japan	4,058	2,797	33	3,679	3,712	2,776	0.7
Netherlands East Indies (Borneo, Ceram, Java, New Guinea, Sumatra)	770	60,043	491	623	1,114	83,477	74.9
Total Far East	5,040	120,734	602	4,497	5,099	157,466	
OCEANIA:							
Australia	n.a.	3	n.a.	n.a.	n.a.	3	
Total Oceania	n.a.	3	n.a.	n.a.	n.a.	3	
Total Outside United States‡	29,604	3,427,695	4,936	19,298	30,920	4,009,946	129.7
UNITED STATES	428,522	5,336,900	49,720	390,243	439,963	5,675,523	12.9
TOTAL WORLD‡	458,126	8,764,595	54,656	410,541	470,883	9,685,469	20.6

* To end of June, 1948. † Estimated. ‡Based on available data. n.a. Data not available.

GREASE MANUFACTURE SIMPLIFIED
Time Saved . . . Cost Reduced

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PRESSURE SOAP CONTACTORS and OIL CIRCULATION HEATING SYSTEMS

Make **Soda Fiber Grease in Two Hours . . . .**
Calcium Cup Grease in One Hour

Stratco Alkylation Contactors and Heating Systems, standard oil refinery equipment for many years, now have been adapted to grease manufacture—to provide extremely short manufacturing time cycles, reduced fat consumption, a more uniform product.

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CORPORATION
PETROLEUM REFINING ENGINEERS
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WORLD REFINING

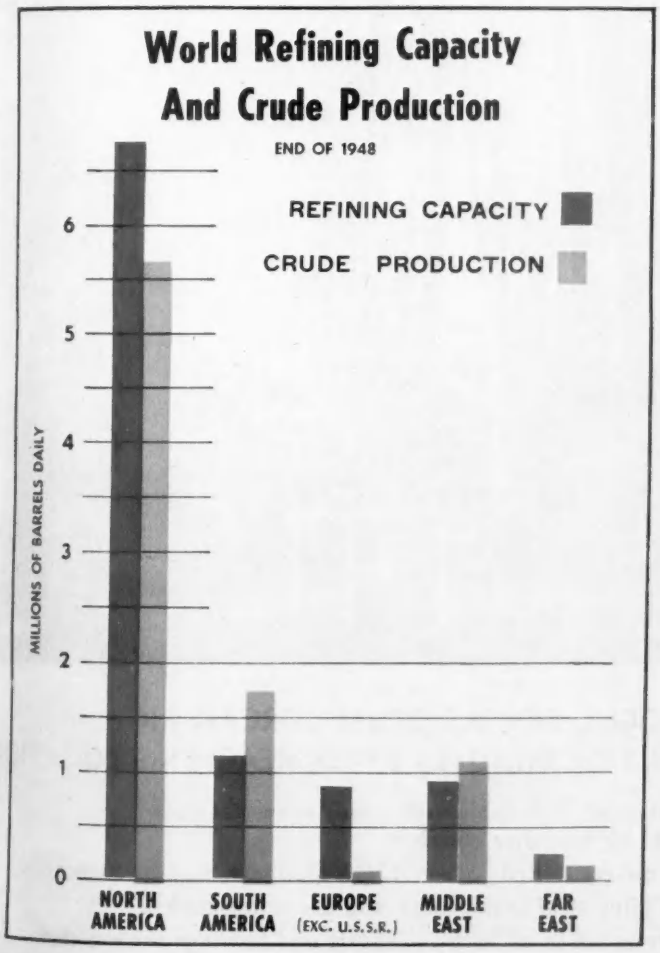
WORLD crude oil refining facilities had a daily capacity of 10,890,826 barrels at the end of 1948, an increase of more than one million barrels since the end of 1947. This capacity was 1½ million barrels greater than daily average crude production during the year.

North America, which had two-thirds of the world's refining capacity, accounted for much of the increase in capacity and its ability to refine exceeded crude oil production by a greater amount than in any other region. North America's 447 plants had a refining capacity of 6,788,705 barrels daily the end of 1948, a sizeable gain over a year previous when its capacity was 6,111,705 barrels per day, and in contrast with a daily average production of 5,702,527 barrels during 1948.

The United States was responsible for the imposing position of North America in the world refining picture, accounting for most of the capacity with facilities able to process 6,348,000 barrels per day.

South America's 55 refining plants had a refining capacity at the end of 1948 totaling 1,120,346 barrels daily, in contrast with a daily production of 1,570,593 barrels during the year. Much crude from Venezuela and Colombia is shipped to the United States and Europe for refining.

In Europe, outside of U. S. S. R. where accurate information was not available, 142 plants had a daily capacity of 808,345 barrels the end of 1948 as contrasted with 674,194 barrels 12 months previous. The increase was due to rehabilitation of war-damaged plants, particularly in France and Germany. Europe had far more refining capacity than its production of crude oil, the latter averaging but 134,790 barrels daily in 1948. Much of Europe's petroleum supply is imported as crude and refined in domestic plants.



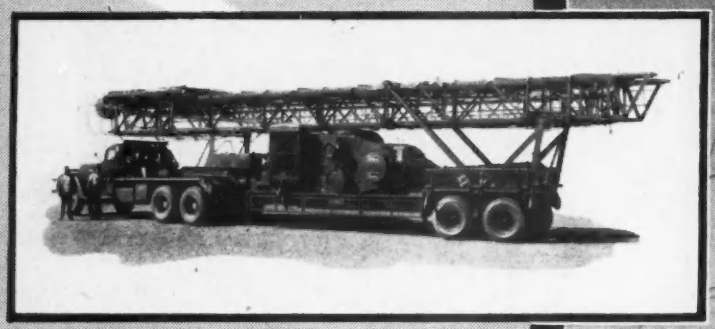
The 10 refineries of the Middle East had a capacity of only 901,300 barrels, although the area produced an average of 1,139,893 barrels daily in 1948. More than half of its refining capacity was in Iran, where the Abadan refinery accounted for most of the country's 502,100 barrels per day of processing capacity.

World Refining Facilities (End of 1948)

CONTINENT and Country	Number of Plants	Daily Refining Capacity (Barrels)	1948 Daily Avg. Crude Production (Barrels)
NORTH AMERICA:			
Canada	39	263,225	33,773
Cuba	3	4,900	306
Mexico	11	172,580	159,481
United States	394	6,348,000	5,508,967
Total North America	447	6,788,705	5,702,527
SOUTH AMERICA:			
Argentina	18	116,220	62,819
Aruba	2	425,000	.....
Bolivia	2	1,794	1,268
Brazil	5	12,650	391
Chile	3	400	Shut-in
Colombia	2	17,700	66,587
Curaçao	1	275,000	.....
Ecuador	2	5,782	7,134
Peru	4	30,300	38,440
Trinidad	5	98,300	55,197
Uruguay	1	10,000	.....
Venezuela	10	127,200	1,333,757
Total South America	55	1,120,346	1,570,593
EUROPE:			
Albania	1	750	978
Austria	8	28,200	15,604
Belgium	4	10,400	.....
Bulgaria	3	2,100	.....
Czechoslovakia	5	3,690	511
Denmark	1	400	.....
France	11	263,250	989
Germany	30	102,085	12,150
Great Britain	21	120,550	883
Hungary	7	11,770	9,784
Italy (including Trieste)	9	35,000	178
Netherlands	1	23,000	9,410
Norway	1	1,000	.....
Poland	5	7,300	2,702
Portugal	1	7,000	.....
Roumania	24	158,450	80,601
Spain, (including Canary Islands)	2	10,500	.....
Sweden	2	13,300	.....
Switzerland	1	1,500	.....
Yugoslavia	5	8,100	1,000
Total Europe	142	808,345	134,790
U. S. S. R.: Includes former Polish area and Asiatic Russia, excluding Sakhalin	41	972,670*	567,896
AFRICA:			
Algeria	2	100	2
Egypt	2	36,800	35,992
Morocco	1	250	260
Total Africa	5	37,150	36,254
ASIA—Middle East:			
Bahrein Island	1	153,500	29,822
Iran	2	502,100	520,205
Iraq	3	10,500	72,311
Kuwait	..	.....	127,178
Lebanon	1	5,000	.....
Palestine	1	90,000	.....
Saudi Arabia	1	140,000	390,309
Turkey	1	200	68
Total Middle East	10	901,300	1,139,893
ASIA—Far East:			
Borneo	3	10,500	15,997
Brunei	..	.....	49,852
Burma	3	1,850	820
China (including Formosa)	2	23,500	1,501
India	1	6,300	5,273
Japan	20	54,460	3,527
Java	2	2,000	1,208
Netherlands New Guinea	..	.....	375
Pakistan	2	6,500	1,530
Sakhalin (U.S.S.R.)	2	n. a.	15,710
Sarawak	1	35,000	935
Sumatra	2	105,000	69,505
Thailand (Siam)	1	n. a.	.....
Total Far East	39	245,110	166,323
OCEANIA:			
Australia	3	17,200	5
TOTAL WORLD	742	10,890,826	9,318,281

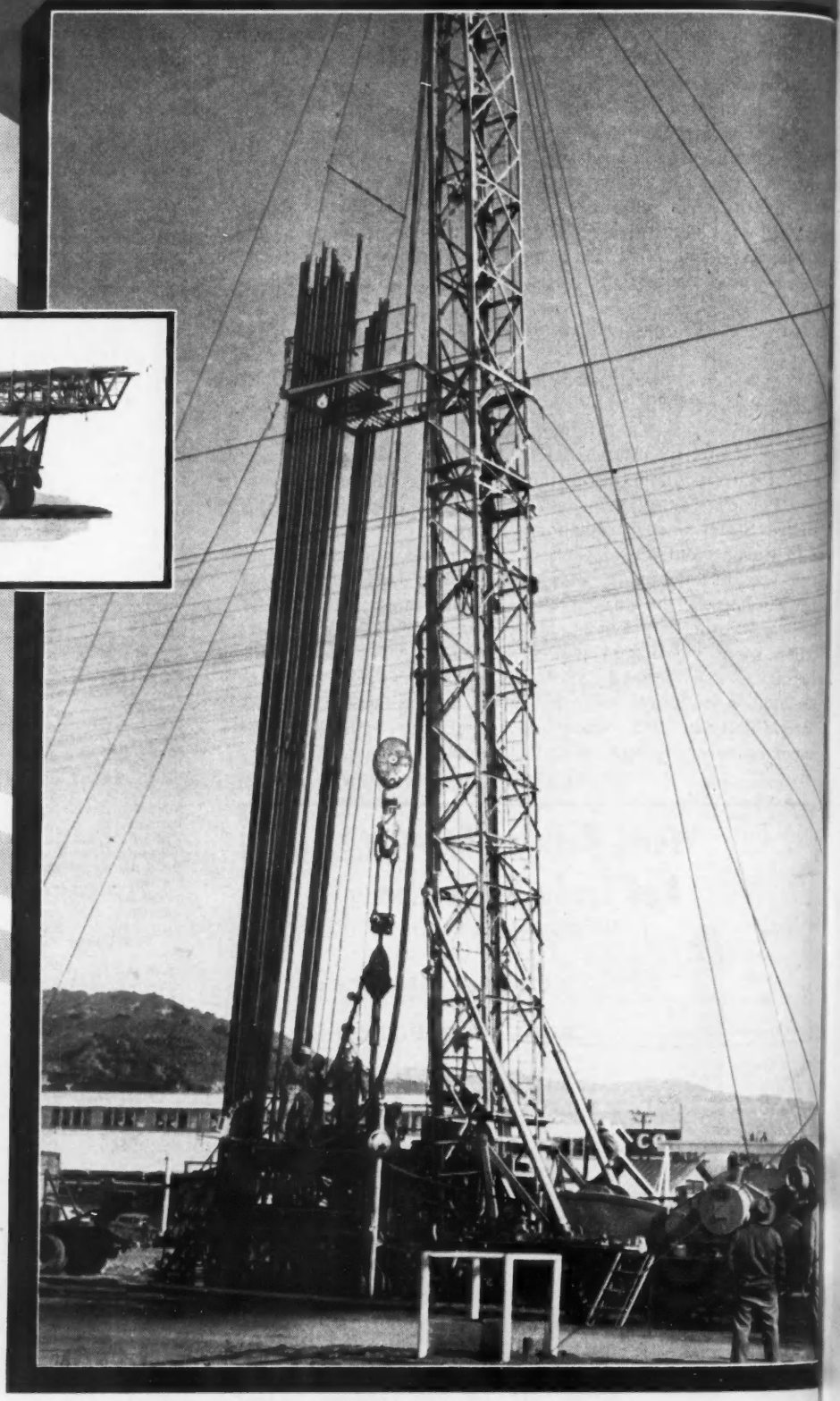
* Estimated.

Years Ahead in



WILSON MOGUL TORCAIR DOUBLE DRUM RIG

Finest on wheels! With 96′ mast, and trailer.



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WILSON NEW TORCAIR ENGINEERED MOGUL RIG

UNDER 8′ OVERALL WIDTH!

RATED CAPACITY

- **Drilling to 4,000 Ft.** (with 4½" drill pipe)
- **Servicing wells to 8,000 Ft.** (with 2½" tubing; without Hydromatic Brake)
- **Servicing wells to 16,000 Ft.** (with 2½" tubing; with 15" double rotor Hydromatic Brake)

Finest DOUBLE DRUM rig in its weight and capacity rating class! The last word in flexibility, trailer-mounted and mast-equipped for the last word in portability and controllability. Complete hydraulic raising and lowering mechanism for the mast . . . no chance of collapse or breakaway . . . it's not necessary to dismantle block when mast is down for traveling!

WILSON MOGUL DOUBLE DRUM TORCAIR RIG READY IN A FEW MINUTES AFTER REACHING LOCATION

- Super-flexible control possible with torque converter drive and WILSON air-tube disc clutches.
- Completely air controlled . . . WILSON designed full vision panel.
- Drums have alloy steel brake rings, and are water-cooled.
- All chain drives run in oil bath . . . shafts and bearings are oversize.

PRINCIPAL OIL COMPANIES—Operating Outside United States

Abbreviations: A.G.—Aktiengesellschaft; C.A.—Compañía Anonima; Cía.—Compañía; Cie.—Compagnie; Co.—Company; Corp.—Corporation; G. m. b. H.—Gesellschaft mit beschrankter Haftung; Gw.—Gewerkschaft; Inc.—Incorporated; Ltd.—Limited; Mij.—Maatschappij; N.V.—Naamloose Vennootschap; Pty.—Propriatary; S.A.—Sociedad Anonima or Société Anonyme.

COMPANY	Location of Producing Fields or Concessions	OWNERSHIP
—A—		
Abasand Oil, Ltd.	Canada	
Administración Nacionál Combustible Alcohol y Portland	Uruguay	Uruguayan Govt.
American Independent Oil Co., Ltd.	Kuwait Neutral Territory	Group of American Independent Companies
American International Fuel and Petroleum Co.	Nicaragua	Gulf Oil Corp. and Atlantic Ref. Co.
Anglo-American Oil Co., Ltd.	Great Britain	Standard (N.J.) and British interests
Anglo-Bahamian Pet. Co., Ltd.	Bahamas	Anglo-Iranian Oil Co.
Anglo-Canadian Oil Co., Ltd.	Canada	Canadian interests
Anglo-Eucadorian Oilfields, Ltd.	Ecuador	British interests
Anglo-Egyptian Oilfields Ltd.	Egypt	Shell Group, Egyptian Government
Anglo-Iranian Oil Co., Ltd.	Iran, Iraq, Kuwait, Bahamas, Great Britain, Trinidad, Egypt. (Partly through subsidiaries)	British Government 52½%; Burmah Oil Co., Ltd. 25%; individuals 22½%
Antilles Pet. Co. (Trinidad) Ltd.	Trinidad	McColl-Frontenac Oil Co.
Apex (Trinidad) Oil fields, Ltd.	Trinidad	British interests
Arabian-American Oil Co.	Saudi Arabia	Standard Oil Co. of Calif. 30%; Standard Oil Co. (New Jersey) 30%; The Texas Co. 30%; Socony-Vacuum Oil Co. 10%
Ashley Gold and Minerals Ltd.	Canada	Canadian interests
Assam Oil Co.	India	Burmah Oil Co.
"Astra" Cía. Argentina de Petróleo S.A.	Argentina	Argentine interests
Astra Romana S.A.	Roumania	Shell Group
Atlantic Refining Co.	Cuba, Venezuela, Haiti	Atlantic Refining Co.
Attock Oil Co., Ltd.	Pakistan	Burmah Oil Co. and other British interests
Australasian Pet. Co. Pty., Ltd.	New Guinea	Anglo-Iranian Oil Co.; Socony-Vacuum Oil Co.
Australian Commonwealth Government	Australia	Australian Government
Australian Mining and Smelting Co., Ltd.	Australia	Australian interests
Australian Motorists Petrol Co., Ltd.	Australia	Australian interests
Australian Oil Development Co.	Australia	Australian interests
Azienda Generale Italiana Petroli	Italy	Italian Government
Azienda Italiana Petroli Albania	Albania	Italian Government
—B—		
Bahamas Oil Co., Ltd.	Bahamas	Superior Oil Co. of Calif.
Bahamas Oil Exploration, Ltd.	Bahamas	Gulf Oil Corp.
Bahamas Mining Co., Ltd.	Bahamas	F. H. Christie et al.
Bahrein Pet. Co., Ltd.	Bahrein	Standard of Calif. and The Texas Co.
Basrah Petroleum Co., Ltd.	Iraq	Iraq Pet. Co.
Bata Petroleums, Ltd.	Canada	
N.V. Bataafsche Pet. Mij.	Netherlands Indies	Shell Group
Bear Oil Co., Ltd.	Canada	Tide Water, Pacific Western, Skelly Oil, Sunray Oil, Pacific Petroleums Ltd.
Beckwith and Co.	Egypt	Standard Oil Co. (N.J.)
Bonaparte Gulf Company, Pty., Ltd.	Australia	Vacuum Oil Co., Pty., Ltd. & Australian and British interests
Braunschweigische Bohrgesellschaft	Germany	German Government
British American Oil Co., Ltd.	Canada	Canadian interests
British Bahamian Oil Dev. Co., Ltd.	Bahamas	Central Mining and Investment Co.
British Controlled Oilfields, Ltd.	Venezuela, Ecuador	British interests
British Malayan Pet. Co., Ltd.	British Borneo	Shell Group
Burbach-Kaliwerke A.G.	Germany	
Burmah Oil Co., Ltd.	Burma, India	Shell Group
—C—		
Caldas Pet. Co.	Colombia	The Texas Co.
Calgary and Edmonton Corp. Ltd.	Canada	Canadian interests
The California Standard Co.	Canada	Standard of Calif.
Calmont Oils, Ltd.	Canada	Canadian interests
Canadian Gulf Oil Co.	Canada	Gulf Oil Corp.
Cape Breton Pet. Co.	Canada	
Caracas Pet. S.A.	Venezuela	British interests
Carolina Oil Co.	Ecuador	Ecudorian interests
Central Area Exploration Co.	Venezuela	British interests
Chinese Pet. Corp.	China	Chinese Government
Colombian Pet. Co.	Colombia	Socony-Vacuum Oil Co. 50%; Texas Co. 50%
Colón Development Co., Ltd.	Venezuela	Shell Group
Commoil Ltd.	Canada	Commonwealth Pet. Ltd.
Cie. des Pétroles de Tunisie Shell	Tunisia	Shell Group 65%; SEREPT 35%
Cie. Française des Pétroles	Iraq	French Government
Cía. Arrendataria del Monopolio de Petróleos S.A. (CAMPSA)	Spain	Spanish Government
Cía. Colombiana de Petróleo El Condor	Colombia	Shell group
Cía. Consolidada de Petróleo	Venezuela	Sinclair Oil Corp.
Cía. de Peten S.A.	Guatemala	Guatamalan and American interests
Cía. de Petróleo del Cravo	Colombia	Tropical Oil Co.
Cía. de Petróleo Ganso Azul, Ltd.	Peru	American interests
Cía. de Petróleo Gran Colombia, S.A.	Colombia	The Texas Co., Richmond Pet. Co., Socony-Vacuum Oil Co.
Cía. de Petróleo Shell de Colombia	Colombia	Shell Group
Cía. de Petróleos del Pacífico	Colombia	Socony-Vacuum Oil Co.
Cía. "El Sosneado" de Petroleo	Argentina	Argentine private interests

COMPANY	Location of Producing Fields or Concessions	OWNERSHIP
Cía. Espanola de Petróleos S.A. (CEPSA)	Venezuela	Spanish interests and Creole Pet. Corp.
Cía. Espanola de Petróleos Scientificas Investigaciones	Spain	Socony-Vacuum Oil Co. and Spanish interests
Cía. Ferrocarrilera de Petróleo	Argentina	British Railways of Argentina
Cía. Peruana de Petróleo "El Oriente"	Peru	Peruvian private interests
Cía. Petrolera la Estrella de Cuba	Cuba	Shell Group
Cía. Petrolera Lobitos	Peru	Lobitos Oilfields Ltd.
Cía. Petrolera del Zulia	Colombia	Tropical Oil Co.
Cías. Unidas de Petróleo	Colombia	Sinclair, Cities Service and Richfield
Concepción Ecuadorian Oilfields, Ltd.	Ecuador	British interests
Condamine Oil Pty., Ltd.	Australia	Australian interests
Conselho Nacional do Petróleo	Brasil	Brazilian Government
Corporación de Fomento de la Producción	Chile	Chilean Government
Creole Petroleum Corp.	Venezuela	Standard Oil Co. (N.J.)
—D—		
Daido Oil Co.	Japan	Japanese interests
Danish-American Prospecting Co.	Denmark	Gulf Oil Corp.
D'Arcy Exploration Co., Ltd.	England, Australia	Anglo-Iranian Oil Co., Ltd.
Decalta Oils	Canada	Canadian interests
Deilman, C. (formerly DEUTAG)	Germany	German interests
Deutsche Erdöl A.G. (DEA)	Germany, Austria	
Deutsche Vacuum Oel A.G.	Germany	Socony-Vacuum Oil Co.
Diadema Argentina S.A. de Petróleo	Argentina	Shell Group
—E—		
Ecuador Oilfields, Ltd.	Ecuador	British Controlled Oilfields, Ltd.
Ecuador Tropical Oil Co.	Ecuador	Eucadorian interests
Eguchi Oil Association	Japan	Japanese interests
Empresa Petrolera Fiscal	Peru	Peru Government
Erdöl Produktions Gesellschaft	Austria	German interests
Esso Standard Oil Co. (Ecuador) S.A.	Ecuador	Standard Oil Co. (N.J.)
—F—		
Far East Development Co.	Philippines	American interests
Foothills Oil and Gas Co. Ltd.	Canada	Imperial Oil Ltd. 85.2%
Freney Kimberley Oil Co.	Australia	
Frome-Broken Hill Co. Pty., Ltd.	Australia	Socony-Vacuum: D'Arcy Exploration Co.
—G—		
Gaspé Oil Ventures, Ltd.	Canada	
Gw. Brenner	Germany	German interests
Gw. Brigitta	Germany	Shell Group; Standard (N.J.)
Gw. Elwerath	Germany, Austria	German interests
Gw. Franz	Germany	German interests
Gw. Norddeutschland	Germany	German interests
Gw. Vereinigte Borgholzhausen	Germany	German interests
Grosadeutsche Schachtbau und Tiefbohrgesellschaft	Germany	German interests
Guasare Oil Co.	Venezuela	Drilling and Exploration Co.; Lion Oil Refining Co., et al.
Gute Hoffnungshutte	Germany	German interests
—H—		
Hamburger Gasgesellschaft	Germany	German interests
Hokkaido Oil Development Co.	Japan	Japanese interests
Hokuriku Oil Association	Japan	Japanese interests
Home Braseau Syndicate	Canada	Home; Anglo-Canadian; Imperial; Shell; Socony-Vacuum; Cal. Standard
Home Oil Co. Ltd.	Canada	Canadian interests
Honolulu Oil Corp.	Canada	Honolulu Oil Co.
Hudson's Bay Oil & Gas Co. Ltd.	Canada	Continental Oil Co. (Del.)
Husky Oil & Ref. Co.	Canada	Husky Ref. of Wyo.
—I—		
Imperial Oil Co.	Japan	Japanese interests; Japanese Government
Imperial Oil Ltd.	Canada	Standard (N.J.) 70%
Indo-Burma Pet. Co., Ltd.	Burma	British interests
International Ecuadorean Pet. Co.	Ecuador	Standard Oil Co. (N.J.)
International Pet. Co., Ltd.	Peru, Venezuela	Standard (N.J.); holds 25% interest in Mene Grande's Venezuela production
International Tiefbohr-Kommandit Gesellschaft (ITAG)	Germany, Austria	German interests
Iraq Petroleum Co., Ltd.	Iraq	Anglo-Iranian 23.75%; Shell Group 23.75% Near East Development Co. 23.75% Cie. Française des Pétroles 23.75%; C. I. Gulbenkian 5%
Ishikawa Co.	Japan	Japanese interests
Island Development Co., Ltd.	Canada	Cities Service Oil Co.; Socony-Vacuum Oil Co.
—J—		
Jordan Exploration Co., Ltd.	Palestine	British interests
—K—		
Kalimna Oil Co.	Australia	
Kaliwerke Salzdetfürth	Germany	
Karita Industrial Co.	Japan	Japanese interests
Kermanshah Pet. Co., Ltd.	Iran	Anglo-Iranian Oil Co., Ltd.
Kern Trinidad Oilfields, Ltd.	Trinidad	Kern Oil Co., Ltd.
Khanaqin Oil Co., Ltd.	Iraq	Anglo-Iranian Oil Co., Ltd.
Khaneh Pet. Co.	Iraq	Iraq Pet. Co.; Anglo-Iranian Oil Co.
Kohle-Öl-Union von Busse A.G.	Germany	
Koller, Ferd., and Sohn	Germany	German interests
Kuwait Oil Co., Ltd.	Kuwait	Gulf Exploration Corp. 50%; Anglo-Iranian 50%

PRINCIPAL OIL COMPANIES—Operating Outside United States

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COMPANY	Location of Producing Fields or Concessions	OWNERSHIP
—L—		
La Junta Pet. Co.	Colombia	The Texas Co.
Lakes Oil Ltd.	Australia	Australian interests
Lebanon Pet. Co., Ltd.	Lebanon	Iraq Pet. Co.
Lion Oil Refining Co.	Canada	American interests
—M—		
MacMillan Pet. Corp.	Sicily	American interests
Maden Tetkik ve Arama Enstitusu	Turkey	Turkish Government
Magyar Amerikai Olajipari Részvénytáraság (MAORT)	Hungary	Standard Oil Co. (N.J.)
McColl-Frontenac Oil Co., Ltd.	Canada	The Texas Co. 50%
Mene Grande Oil Co., C.A.	Venezuela	Cities Service Company
Mexican Gulf Oil Co.	Mexico	Gulf Oil Corp.
Mexico-Cities Service Pet. Corp.	Mexico	Gulf Oil Corp.
Mosul Pet. Co., Ltd.	Iraq	Iraq Pet. Co.
Mozambique Gulf Oil Co.	Mozambique	Gulf Oil Corp.
Murilla Oil Ltd.	Australia	Australian interests
Muskeg Syndicate	Canada	Gulf, Shell, Imperial, Socony-Vacuum, McColl-Frontenac.
—N—		
Nassau Oil Mining Co., Ltd.	Bahamas	British interests
National Mining Corp. Ltd.	Trinidad	British interests
Naval Petroleum Reserve Operating Committee	Alaska	U.S. Government
Near East Development Corp.	Iraq (Owns interest in Iraq Pet. Co.)	Standard Oil Co. (N.J.); Socony-Vacuum Oil Co.
N. V. Nederlandsche Aardolie Mij.	Netherlands	50% Standard (N. J.); 50% N. V. de Bataafsche Pet. Mij.
Nederlandsche Indische Aardolie Mij.	Sumatra	50% Shell Group; 50% Netherlands Govt.
Nederlandsche Nieuw Guinee Pet. Mij.	Netherlands New Guinea	40% Shell Group; 40% Standard-Vacuum; 20% Standard of Calif.-The Texas Co.
Nederlandsch Olie Mij	Venezuela	Shell Group
Nederlandsch Pacific Pet. Mij.	Netherlands Indies	Standard of Calif. 50%; The Texas Co. 50%
New Brunswick Oilfields, Ltd.	Canada	American and Canadian interests.
Niederdonau Erdöl G. m. b. H.	Austria	DEA, Wintershall, Pressag, Elwerath Co's.
Nippon Oilfield Co.	Japan	Japanese interests
North Venezuelan Pet. Co., Ltd.	Venezuela	British interests
Nova Scotia Oil and Gas Co., Ltd.	Canada	.....
—O—		
Okalta Oils Ltd.	Canada	Canadian interests
Oldenburger Erdöl G.m.b.H.	Germany	Standard (N. J.) 33⅓%; Socony-Vacuum 33⅓%; Shell 33⅓%
Orinoco Oil Co. of Venezuela	Venezuela	Pure Oil Co.
—P—		
Pacific Petroleums Ltd.	Canada	Canadian interests
Pacific Western Oil Corp.	Canada	American interests
Pancoastal Oil Co., C. A.	Venezuela	Pantepec Oil Co. of Venezuela, C. A.
Pantepec Oil Co., C. A.	Venezuela	Pantepec Oil Co. of Venezuela, C. A.
Pechelbronn S.A. d'Exploration Miniere.	France	French Government
Peninsular Oil Corp., Ltd.	Canada	.....
Petróleos Ariguani S.A.	Colombia	50% Tropical Oil Co.; 50% Colombian interests
Petróleos Mexicanos (Pemex)	Mexico	Mexican Government
S.A. Petrolera las Mercedes	Venezuela	The Texas Co. 50%; Caracas Pet. Co. 50%
Petroleum Concessions Ltd.	Hadhramaut and Aden	Iraq Pet. Co.
Petroleum Development Ltd.	Cyprus, Oman & Dhofar, Palestine, Qatar, Trucial Coast	Iraq Pet. Co.
Petrópolis Oil Co.	Ecuador	Ecuadorian interests
Phillips Petroleum Ltd.	Canada	Phillips Pet. Co.
Phillips Venezuelan Oil Co.	Venezuela	Phillips Pet. Co.
Pictou Pet. Co., Ltd.	Canada	.....
"Pram" Erdöl Explorations G.m.b.H.	Austria	.....
Premier (Trinidad) Oilfields, Ltd.	Trinidad	British interests
"Preussag" Preussische Bergwerke und Hütten A.G.	Germany	German Government
Princess Brooks Syndicate	Canada	Canadian and American interests
—Q—		
Quaich Oil Corp. Ltd.	Canada	Canadian interests
—R—		
Ram River Oils Ltd.	Canada	Canadian interests
Régie Autonome des Pétroles (RAP)	France	French Government, and private interests
Richmond Exploration Co.	Venezuela	Standard Oil Co. of Calif.
Richmond Pet. Co. of Calif.	Colombia	Standard Oil Co. of Calif.
Ritz, Louis, and Co.	Germany	.....
Roboel Gewinnungs A.G. (RAG)	Austria	Socony-Vacuum Oil Co. 50%; Shell Group 50%
Romano-Americana S.A. pour l'Industrie le Commerce et l'Exportation du Pétrole	Roumania	Standard Oil Co. (N.J.)
Roma Blocks Oil Co.	Australia	.....
Roma North Oil Co.	Australia	.....
Roma Oil Corp., Ltd.	Australia	.....
Roxana Oil Co., Ltd.	Canada	Canadian interests
Royalite Oil Co. Ltd.	Canada	Imperial Oil Ltd.
—S—		
Saito Oil Company	Japan	.....
Sarawak Oilfields, Ltd.	Sarawak	Shell Group
Schachtbau and Tiefbohr-Gesellschaft	Germany	German Government
Shell Caribbean Pet. Co.	Venezuela	Shell Group
Shell Exploration New Brunswick	Canada	Shell Group
Shell Oil Co. of Canada, Ltd.	Canada	Shell Group
Shell Co. of Ecuador, Ltd.	Ecuador	Shell Group
Shell Co. of Egypt, Ltd.	Egypt	Shell Group
Shell Overseas Exploration Co., Ltd.	Bahamas	Shell Group
Shell (Queensland) Dev. Pty., Ltd.	Australia	Shell Group
Shunda Oils, Ltd.	Canada	.....
Sinclair-Panama Oil Corp.	Panama	Sinclair Oil Corp.
Sinclair Oil Co. of Venezuela	Venezuela	Sinclair Oil Corp.
Sinclair Pet. Co., Ltd.	Ethiopia	Sinclair Oil Corp.
Sindicato Ganadero Colombiano	Colombia	The Texas Co.
Siparia Trinidad Oilfields Ltd.	Trinidad	British interests
Sociedad De Fomento Petrolero	Colombia	Socony-Vacuum Oil Co.
Società Idrocarburi Nazionale	Italy	Italian interests
Società Italiana del Petrolio el Affini	Italy	Shell Group
Società Petroli d'Italia	Italy	Italian interests
Società Petrolifera Italiana (SPI)	Italy	Standard Oil Co. (N.J.)
Société Chérifienne des Pétroles	Morocco	French and Moroccan Governments
Société d'Etudes et de Recherches Pétrolières en Tunisie (SEREPT)	Tunisia	French and Tunisian Governments
Société Nationalè d'Etudes et de Recherches Pétrolieres en Algerie	Algeria	French and Algerian Governments
Société Nationale des Pétroles D'Aquitaine	France	French Government 55%; French interests 45%
Société Nationale des Pétroles du Languedoc Mediterraneén	France	French Government 55%; French interests 45%
Société Nord-Africaine des Pétroles Gulf	Tunisia	Gulf Oil Corp. 65%; (SEREPT) 35%
Socony-Vacuum Oil, C.A.	Venezuela	Socony-Vacuum Oil Co.
Socony-Vacuum Oil Co., Inc.	Egypt	Socony-Vacuum Oil Co.
Socony-Vacuum Exploration Co.	Canada	Socony-Vacuum Oil Co.
Socorro Petroleum Co.	Colombia	The Texas Co.
Sohio Corp.	Guatemala	Sohio Pet. Co.
Soviet Mineral Oil Administration	Austria	U.S.S.R.
Sovmagnafta Co.	Hungary	Hungarian Government 50%; U.S.S.R. 50%. Now operating all oil properties in Hungary
Sovrompetrol Oil Co.	Roumania	Russian and Roumanian Governments. Now operating properties of Concordia (Belgium), Columbia (French), Creditul Minier, Redeventza and IRDP
Standard Amerikaansk Pet. Co.	Netherlands	Standard Oil Co. (N.J.)
Standard Française des Pétroles S.A.	France	Standard (N.J.)
Standard Oil (Bahamas), Ltd.	Bahamas	Standard Oil Co. (N.J.)
Standard Oil Co. of Egypt, Ltd.	Egypt	Standard Oil Co. (N.J.)
Standard Oil Co., S.A. Argentina	Argentina	Standard Oil Co. (N.J.)
Standard Oil Co. of Cuba	Cuba	Standard Oil Co. (N.J.)
Standard Pacific Synd. et al	Canada	Cal. Standard, Pacific, Princess, Empire, Homestead, Globe, Phillips, D. C. McDonald
N.V. Standard-Vacuum Pet. Mij.	Netherlands Indies	Socony-Vacuum 50%; Standard (N.J.) 50%
Stanolind Oil & Gas Co.	Canada	Standard Oil Co. (Ind.)
Stapper and Osborn, S.A.	Gautemala	American interests
Steaua Româna S.A. pour l'Industrie du Pétrole	Roumania	German, English, French, Roumanian interests
Steinberg-Naptha	Austria	German (ITAG, Elwerath)
Structure Drilling Co.	Canada	.....
Sun Oil Company, Ltd.	Canada	Sun Oil Co.
Superior Oils, Ltd.	Canada	Canadian interests
Sydney Pet. Co.	Canada	.....
Syrian-American Oil & Gas Co.	Syria	J. W. MenHall
Syria Pet. Co., Ltd.	Syria	Iraq Pet. Co.
—T—		
Tampico Texas Pet. Corp.	Canada	.....
Teikoku (Imperial) Oil Co.	Japan	Japanese interests
Texas Petroleum Co.	Venezuela, Colombia	The Texas Co.
Tone Boring Company	Japan	.....
Transjordan Pet. Co., Ltd.	Transjordan	Iraq Pet. Co.
Trinidad Central Oilfields, Ltd.	Trinidad	.....
Trinidad Consolidated Oilfields, Ltd.	Trinidad	British interests
Trinidad Leaseholds Ltd. (TLL)	Trinidad	British interests
Trinidad Northern Areas Ltd.	Trinidad	UBOT, d'Arcy, TLL
Trinidad Oilfields Operating Co., Ltd.	Trinidad	Standard Oil Co. (N.J.)
Trinidad Pet. Development Co., Ltd.	Trinidad	British interests
Tropical Oil Co.	Colombia	Standard Oil Co. (N.J.)
Tubará Oil Company	Colombia	Tropical Oil Company
—U—		
Union Oil Co. of California	Canada	American interests
Union Oil Paraguay	Paraguay	Union Oil Co. of Calif.
United British Oilfields of Trinidad. Ltd.	Trinidad	Shell Group
—V—		
Vacuum Oil Co. Pty., Ltd.	Australia	Standard-Vacuum Oil Co.
R. V. Van Sickle	Austria	.....
Venezuelan Atlantic Ref. Co.	Venezuela	Atlantic Ref. Co.
Venezuela Oil Concessions, Ltd.	Venezuela	Shell Group
Venezuela Pet. Co.	Venezuela	Sinclair Oil Corp.
—W—		
Westdeusche Bohrgesellschaft (Siepsand Co.	Germany	.....
Wintershall A.G.	Germany, Austria	.....
—Y—		
Yacimientos Petroliferos Fiscales Bolivianos (Y.P.F.B.)	Bolivia	Bolivian Government
Yacimientos Petroliferos Fiscales (Y.P.F.)	Argentina	Argentine Government
—Z—		
Zinc Corporation, Ltd.	Australia	Australian interests

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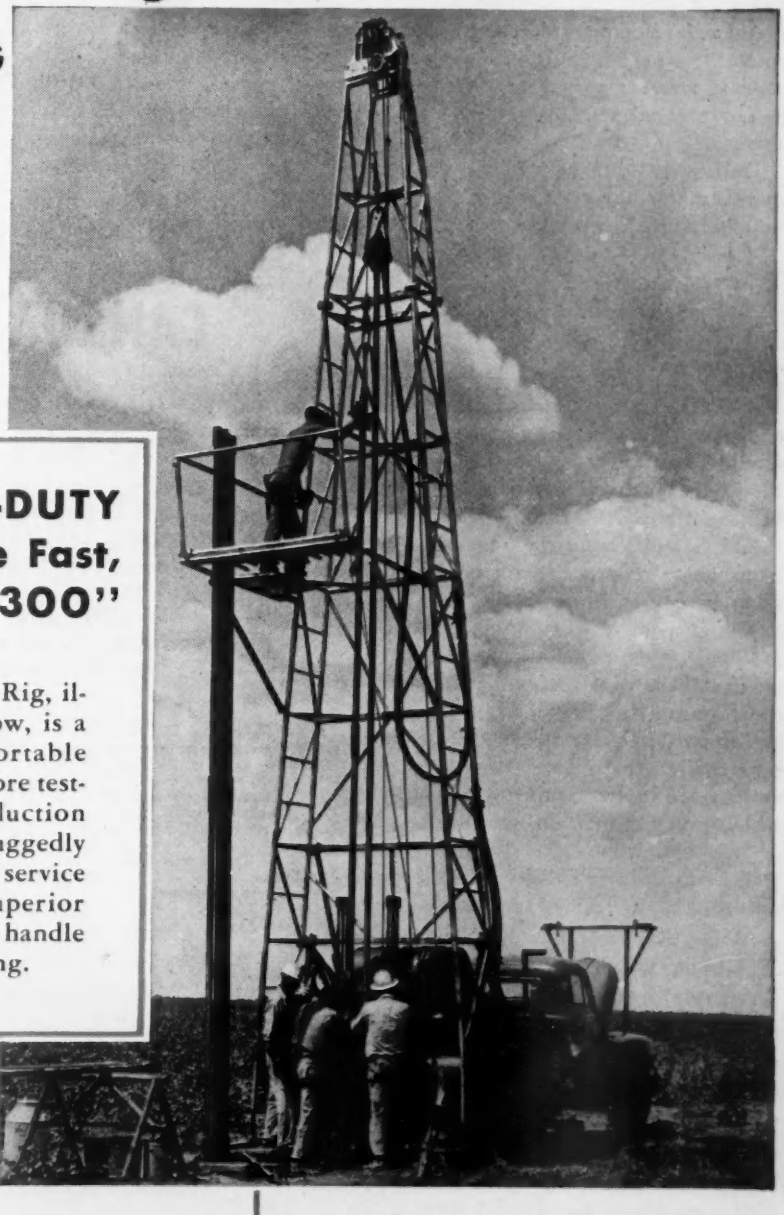

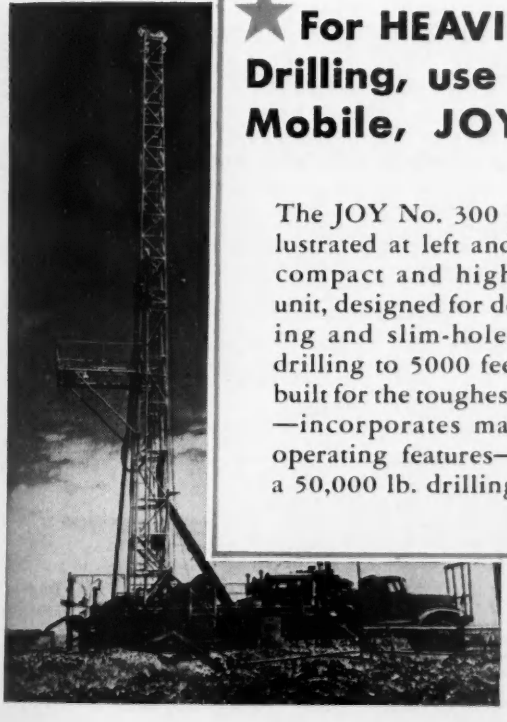

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ALASKA

AN ACTIVE exploration campaign has been mapped for Alaska during 1949, following expansion during 1948 of the previous activity. Alaskan exploration is currently confined to the search for oil on Naval Petroleum Reserve No. 4. Arctic Contractors, Inc. is carrying on the actual work under the direction of an Operating Committee headed by Commodore William G. Greenman. During 1948, in addition to extensive geological and geophysical work which saw the further development of efficient transportation methods by tractor trains, and airborne geophysical units, a 7,000 foot wildcat was completed near Cape Simpson which was abandoned at basement, just below the Upper Cretaceous formations.

During 1949 there will be six geological parties active, mapping structures for future drilling as well as working out detailed surface geology of the Reserve. There will be one flying gravity meter party working a sector including the northwest part of the Reserve along the Arctic Ocean and inland. There will also be four geophysical crews working to detail structures in the north and east part of the reserve, and a series of 1200-foot core holes will be drilled at the oil seeps near Simpson. Wildcatting will include a test near the Fish Creek seeps and a deep test at Oumalik, about 100 miles south of Barrow, the latter to be drilled with a heavy rig capable of going to 15,000 feet if indications above 6,000 feet are favorable. There are now two rigs capable of deep drilling, and two medium-duty portable rigs on the Reserve, and it is planned to move in another heavy rig from Petroleum Reserve No. 1 in California. Showings of oil have already been found in the Fish Creek and Umiat areas in the eastern part of the Reserve, and shows of gas were found in the Simpson well.

CANADA

CANADA'S province of Alberta became, during 1948, one of the world's outstanding oil areas. Although its actual production has not been raised to a point where it will be a threat to the balance of economy for a number of years, it became the most active single region in the world next to the U. S. and Venezuela. This of course excludes the U.S.S.R. from which reports are not full enough to allow its consideration in comparisons.

Along with Alberta, the neighboring province of Saskatchewan is now receiving its share of attention, being a continuation of the great basin in which the important Alberta discoveries have been made. At the same time there was an increase in Eastern Canadian activity which gives the nation an all-time peak in oil exploration and development as well as establishing a new all-time peak production of 12,371,113 barrels.

At the beginning of 1947 the province of Alberta, which had been contributing the major portion of Canada's oil, was still in the period of decline which came with the decrease of production at Turner Valley, and nothing was in sight which would serve to arrest it. The discovery of Leduc field in February of that year touched off the exploratory campaign which has gained momentum with discovery of other fields. The most important of 1948 was Redwater, northeast of Edmonton, which produces from the same prolific formation which is expected to yield upward of 200 million barrels of crude at Leduc, from the same type of coral reef structure. The Redwater discovery found 146 feet of pay in the Devonian to compare with 38 feet of oil pay at Leduc. Redwater development has been extremely rapid, and by early 1949 it was already producing 12,000 barrels daily and had 11 rigs running.

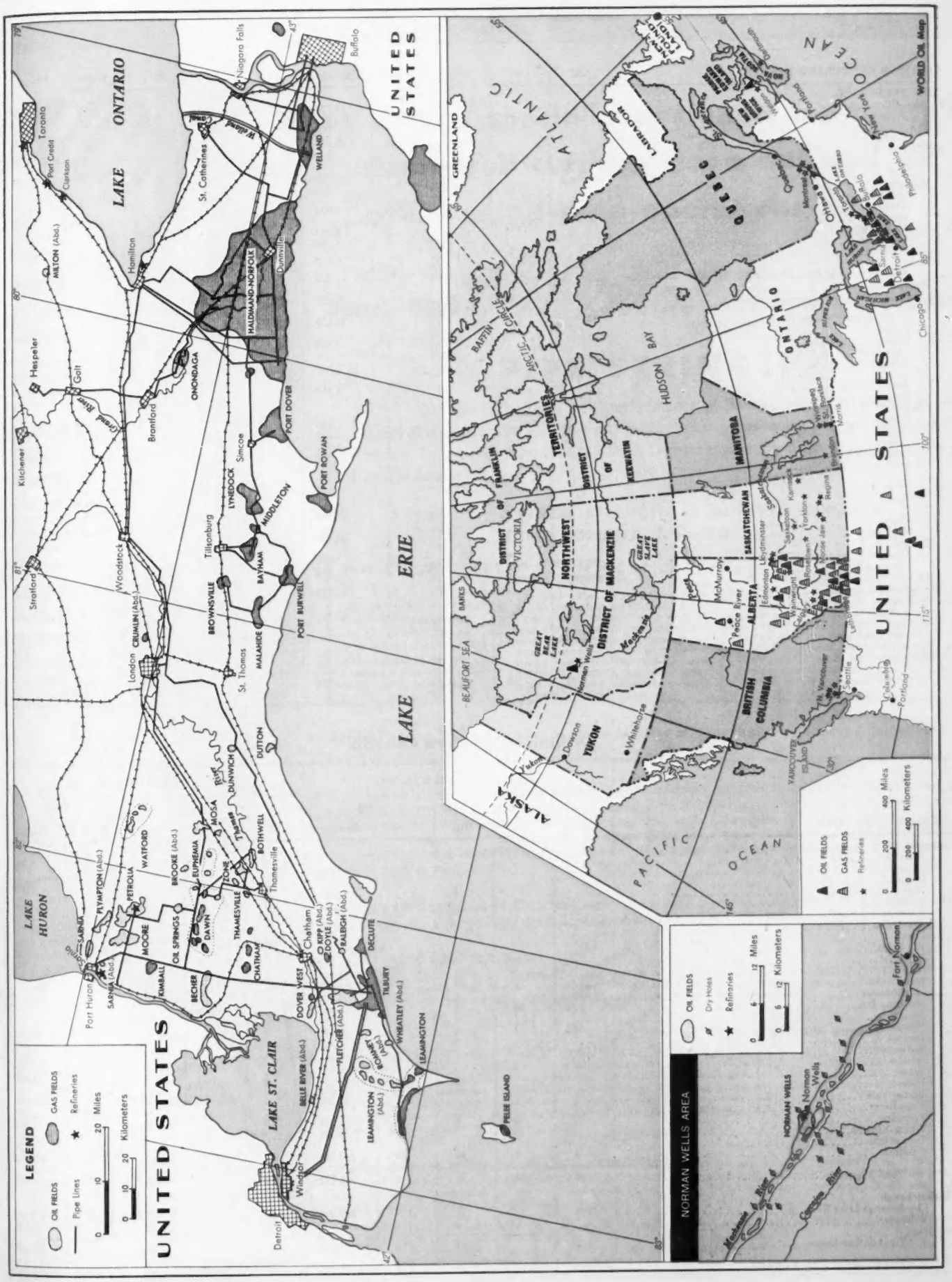
Leduc field meanwhile, has attained major status, with extension into the Woodbend area to the north early in 1948, and discovery of Lower Cretaceous production to the east and other extensions to the south. At the end of 1948 it was producing 21,000 barrels a day, most of which comes from the D3 zone of the Devonian, even with production rigidly prorated by the Conservation Board.

In the southwest corner of Alberta, Canadian Gulf Oil

Producing Wells and Oil Production in Western Canada

PROVINCE AND FIELD	Year of Discovery	Total Producing Wells 1948	Daily at End 1948	Year 1947	Year 1948	Cumulative Through 1948
ALBERTA:						
Turner Valley:						
Limestone Zone	1936	293	11,290	5,017,292	4,428,688	90,582,405
Shallow Zone Oil	1914	3	6	5,058	3,396	510,882
Natural Gasoline	....	...	1,700	427,223	468,655	6,758,620
Total Turner Valley	....	296	12,996	5,449,573	4,900,739	97,851,907
Leduc:						
Lower Cretaceous	1948	6	497	.....	40,935	40,935
D2 Zone	1947	43	4,362	116,246	863,332	979,578
D3 Zone	1947	123	16,467	256,181	3,753,104	4,009,285
Total Leduc	....	172	21,326	372,427	4,657,371	5,029,798
Other Fields:						
Armelgra	1943	...	.....	.....	.....	462
Armena	1948	1	.....	.....	1,184	1,184
Bantry	1947	1	45	30	15,666	15,696
Baxter Lake	1946	...	.....	664	.....	2,680
Brooks	....	2	.....	.....	853	853
Conrad	1944	17	466	202,929	179,627	763,630
Del Bonita-Twin River	1939	3	.....	3,841	8,433	45,199
Dina	1929	1	.....	4,159	4,200	45,711
Hanna	1948	1	45	.....	175	175
Hay Lake Dome	1946	...	.....	.....	.....	1,140
Jumping Pound	1944	2	.....	2,619	741	9,259
Keho Lake	....	...	.....	.....	.....	955
Lloydminster-Blackfoot	1940	63	1,126	304,707	648,055	1,069,095
Moose Dome	1937	...	.....	.....	.....	8,977
Princess-Jefferson	1945	1	165	41,580	60,565	220,929
Princess	1940	13	344	65,340	125,828	245,449
Pincher Creek	1948	1	.....	.....	2,241	2,241
Provost	1946	...	.....	115	.....	1,673
Ram River	1944	...	.....	.....	.....	207
Red Coulee	....	...	.....	.....	.....	328,711
Redwater	1948	2	547	.....	36,875	36,875
Skiff	....	...	.....	.....	.....	8,298
Taber	1937	20	501	205,236	201,527	1,040,898
Tilley	1942	...	.....	.....	.....	14,513
Vermilion	1939	53	296	138,402	112,331	1,090,987
Volmer	1948	1	.....	.....	—41	41
Wainwright	1922	8	26	17,661	17,131	270,915
Total Other Fields		199	3,561	987,283	1,415,473	5,226,553
Total Alberta		667	37,883	6,809,283	10,973,583	108,108,258
SASKATCHEWAN:						
Lloydminster-Lone Rock	1942	92	1,526	540,117	849,166	1,532,506
DISTRICT OF MacKENZIE:						
Norman Wells	1920	n.a.	956	228,398	349,768	2,743,801
Western Canada Total:		759	40,365	7,577,798	12,172,517	112,384,565

CANADA—Ontario and District of Mackenzie Fields


LAKE ONTARIO
LAKE ERIE
LAKE HURON
LAKE ST. CLAIR
UNITED STATES
ATLANTIC OCEAN
PACIFIC OCEAN
HUDSON BAY
GREENLAND
ALASKA
YUKON
NORTHWEST TERRITORIES
DISTRICT OF MACKENZIE
DISTRICT OF KEEWATIN
DISTRICT OF FRANKLIN
DISTRICT OF VICTORIA
ONTARIO
QUEBEC
MANITOBA
SASKATCHEWAN
ALBERTA
BRITISH COLUMBIA
NEWFOUNDLAND
LABRADOR
VANCOUVER ISLAND
PRINCE EDWARD ISLAND
NORMAN WELLS AREA
Toronto
Hamilton
Buffalo
Niagara Falls
Detroit
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Ottawa
Quebec
Winnipeg
Regina
Edmonton
Calgary
Vancouver
Seattle
Portland
Whitehorse
Dawson
Norman Wells
Fort Norman
Fort Simpson
Fort Smith
Yellowknife
Aklavik
Inuvik
Resolute
Baffin Island
Melville Island
Banks Island
Victoria Island
Prince of Wales Island
Somerset Island
Boothia Peninsula
King William Island
Devon Island
Ellesmere Island
Axel Heiberg Island
Ellef Ringnes Island
Amund Ringnes Island
Cornwallis Island
Bathurst Island
Melville Peninsula
Southampton Island
Coats Island
Mansel Island
Akimiski Island
Belle Isle
Anticosti Island
Prince Edward Island
Cape Breton Island
Newfoundland
Labrador
Greenland
Arctic Circle
Mackenzie River
Peace River
Great Slave Lake
Great Bear Lake
Athabasca
Yukon
Liard River
Hay River
Fort Nelson
Fort St. John
Dawson Creek
Prince George
Prince Rupert
Kamloops
Kelowna
Nelson
Trail
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Calgary
Edmonton
Red Deer
Lloydminster
Saskatoon
Prince Albert
Moose Jaw
Swift Current
Yorkton
Brandon
Portage la Prairie
Winnipeg
Thunder Bay
Sault Ste. Marie
Sudbury
North Bay
Timmins
Kirkland Lake
Cochrane
Kapuskasing
Hearst
Moosonee
Moose Factory
Fort Albany
Attawapiskat
Sandy Lake
Pickle Lake
Red Lake
Kenora
Dryden
Fort Frances
Rainy River
Port Arthur
Fort William
Nipigon
Geraldton
Longlac
Terrace Bay
Marathon
Wawa
Chapleau
Kirkland Lake
Timmins
Cochrane
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Terrace Bay
Marathon
Wawa
Chapleau
Sudbury
North Bay
Timmins
Kirkland Lake
Cochrane
Kapuskasing
Hearst

CANADA—Continued

Drilling in Eastern Canada

PROVINCE, COUNTY AND TOWNSHIP	WELLS COMPLETED IN 1947					WELLS COMPLETED IN 1948				
				Total					Total	
	Oil	Gas	Dry	Wells	Footage	Oil	Gas	Dry	Wells	Footage
NEW BRUNSWICK:										
Stoney Creek	.....	5	.....	5	13,136	.....	1	.....	1	1,702
Wildcats	.....	.....	.....	.....	.....	.....	.....	3	3	11,202
NOVA SCOTIA:										
Wildcats	.....	.....	3	3	13,445	.....	.....	.....	.....	.....
ONTARIO:										
Brant:										
Tuscarora	.....	1	.....	1	1,420	.....	2	.....	2	1,409
Elgin:										
Aldborough	.....	.....	.....	.....	.....	.....	7	4	11	17,022
Bayham	.....	1	1	2	1,994	.....	2	1	3	4,287
Dunwich	.....	.....	.....	.....	.....	.....	.....	2	2	3,037
Malahide	.....	1	2	3	3,153	.....	.....	.....	.....	.....
Yarmouth	.....	4	2	6	11,800	.....	.....	.....	.....	.....
Wildcats	.....	.....	.....	.....	.....	.....	7	4	11	17,022
Essex:										
N. Colchester, Malden, Kingsville	.....	1	9	10	11,020	2	4	3	9	10,222
Haldimand:										
Haldimand	.....	86	53	139	108,421	.....	71	48	119	93,312
Kent:										
Chatham and Camden Gore	.....	1	7	8	13,455	.....	1	5	6	10,623
Dover	.....	.....	.....	.....	.....	.....	1	4	5	15,250
Howard	.....	.....	1	1	1,743	.....	.....	.....	.....	.....
Orford	.....	.....	1	1	575	.....	.....	1	1	1,890
Raleigh	.....	.....	1	1	3,351	.....	.....	1	1	3,911
Romney	.....	.....	.....	.....	.....	.....	1	3	4	5,534
Zone	.....	2	1	3	4,850	.....	2	3	5	6,338
Wildcats	.....	.....	.....	.....	.....	.....	1	2	3	11,658
Lambton:										
Bosanquet	.....	.....	1	1	580	.....	.....	1	1	485
Brooke	.....	.....	4	4	5,109	.....	.....	2	2	2,626
Dawn	.....	3	1	4	5,965	.....	.....	2	2	3,496
Enniskillen	.....	.....	5	5	4,185	6	.....	3	9	9,092
Euphemia	.....	.....	3	3	3,909	2	.....	10	12	4,489
Moore	.....	3	9	12	16,830	.....	5	9	14	32,397
Plympton	.....	.....	2	2	5,123	.....	.....	1	1	525
Sarnia	.....	2	1	3	3,866	.....	.....	1	1	1,890
Sombra	9	4	14	27	51,448	6	1	8	15	29,809
Warwick	.....	.....	.....	.....	.....	.....	.....	3	3	3,108
Wildcats	.....	3	2	5	11,699	.....	.....	.....	.....	.....
Lincoln:										
Caistor	.....	12	4	16	7,681	.....	8	1	9	4,323
Gainsboro	.....	1	.....	1	540	.....	.....	.....	.....	.....
Norfolk:										
Norfolk	.....	18	6	24	30,533	.....	25	17	42	50,165
Welland:										
Welland	.....	48	11	59	48,508	.....	47	21	68	48,020
Middlesex:										
Metcalfe and Mosa	12	.....	7	19	7,739	9	.....	6	15	8,571
Manitoulin Island	.....	.....	.....	.....	.....	.....	.....	5	5	3,148
Other Areas	.....	.....	.....	.....	.....	.....	3	4	7	7,483
TOTAL	21	196	151	368	392,078	25	189	178	392	424,046

Drilling in Western Canada

PROVINCE AND FIELD	WELLS COMPLETED IN 1947					WELLS COMPLETED IN 1948				
				Total					Total	
	Oil	Gas	Dry	Wells	Footage	Oil	Gas	Dry	Wells	Footage
Alberta										
Armena	....	....	....	....	.....	1	....	....	1	4,998
Athabaska	....	....	....	....	2,700	....	....	....	.....	.....
Bantry	....	....	....	....	.....	....	....	2	2	7,203
Bon Accord	....	....	1	1	2,531	....	....	....	.....	.....
Brooks	....	1	....	1	2,310	1	....	1	2	7,281
Conrad	....	....	....	.....	.....	....	....	2	2	6,317
Del Bonita	1	....	....	1	5,098	1	....	1	2	10,119
Dina	2	....	....	2	3,484	1	....	3	4	7,314
Elk Point	....	....	....	.....	.....	1	2	2	5	6,883
Foremost	....	5	7	12	31,016	....	....	3	3	8,231
Hanna	....	....	1	1	11,336	1	1	1	3	11,720
Ledue	32	1	4	37	236,884	131	5	11	150	901,406
Lloydminster	50	....	2	52	110,304	49	....	20	69	141,907
Medicine Hat	....	10	1	11	21,501	....	....	....	.....	.....
Ponoka	....	....	1	1	6,760	....	....	....	.....	.....
Princess	3	1	2	6	26,536	1	2	3	6	20,001
Provost	....	....	1	1	2,341	....	....	1	1	2,472
Redwater	....	....	....	.....	.....	1	....	2	3	12,361
Stettler	....	....	....	.....	.....	....	....	2	2	12,829
Taber	....	....	....	.....	.....	5	....	4	9	29,042
Tofield	....	....	1	1	5,558	....	....	....	.....	.....
Turner Valley	7	....	....	7	83,205	2	4	1	7	69,914
Twin River	....	....	....	.....	.....	....	....	1	1	3,975
Vermilion	....	2	1	3	5,851	3	....	3	6	12,562
Viking-Kinsella	....	5	....	5	10,791	....	3	1	4	9,851
Wainwright	....	....	....	.....	.....	....	....	1	1	2,232
Wildcats	4	9	49	53	287,565	4	3	67	74	361,061
Total Alberta	99	34	71	195	855,771	202	20	134	356	1,663,687
Saskatchewan										
Lloydminster-Lone Rock	104	....	15	119	223,006	46	2	11	59	114,506
Wildcats	....	....	....	.....	.....	1	....	10	11	22,883
Total Saskatchewan	104	....	15	119	223,006	47	2	21	70	137,389
TOTAL WESTERN CANADA	203	34	86	314	1,078,777	249	22	155	426	1,801,570

Baash-Ross News

BAASH-ROSS TOOL COMPANY • LOS ANGELES • HOUSTON • OKLAHOMA CITY • NEW YORK

OUR 29th YEAR

FLASH WELDED JOINTS

eliminate weaknesses of ordinary joint-to-pipe connections!

UNUSUALLY HIGH STRENGTH

as much as 3 times the tensile and torque of other strings with the same diameter!

EXTERNALLY FLUSH DIAMETER

insures free passage through other pipe without hanging up!

The most popular size of Baash-Ross Small-Diameter Pipe—1.660" O.D.—can be run inside any of the following sizes of tubing or drill pipe . . .

TUBING:

2" E. U. or 2" Plain — and larger.

DRILL PIPE:

2⅞" A.P.I. "IF"
3½" A.P.I. "FH" and "IF"
4½" A.P.I. "Regular," "FH" and "IF"
5½" A.P.I. "Regular," "FH" and "IF"
6⅝" A.P.I. "Regular," "FH" and "IF"

Baash-Ross offers a complete range of Small-Diameter Pipe Strings for both sales and rental purposes. Prices, specifications and physical test data will gladly be supplied on request to our nearest office.

Now—

Pipe strings specially designed for today's deep-well cutting, clean out and other small-pipe operations . . .

Baash-Ross *High Strength* Small-Diameter PIPE STRINGS!

To match the deep well performance of Baash-Ross Cutting and Fishing Tools and Baash-Ross Power Swivels, Baash-Ross can now supply you with a new type of small-diameter pipe strings which feature unusually high strength factors—*both in tensile and torque!*

THE HIGH OVERALL STRENGTH IS ACHIEVED THROUGH THESE IMPORTANT FACTORS . . .

1 HIGH STRENGTH PIPE:
The pipe itself is made from chrome-molybdenum alloy steel tubing that is cold-drawn and normalized to provide very high strength-to-weight ratios in the pipe sections themselves.

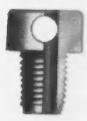
2 HEAT-TREATED TOOL JOINTS:
The tool joints are also made from alloy steel that is specially heat-treated to combine wear-resisting hardness with shock-resisting toughness and strength. The tool joints are internally upset to provide ample metal for the threads, and the thread pattern has been carefully engineered to combine high strength with easy make-up.

3 FLASH WELDED CONSTRUCTION:
The final step to insure all-around high strength is the unique method by which the pipe is joined to the tool joints. A specially-developed flash-weld process is used that not only joins the tool joints *directly* to the pipe (eliminating any threads or other weak points between pipe and joints) *but provides a weld section that is actually stronger than the pipe itself!*

RESULT—a small diameter, light weight pipe string with unusually high strength properties . . . minimum tensile, 100,000 lbs./sq. in.— minimum torque, 47,500 lbs./sq. in!

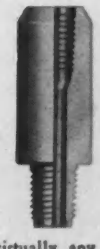
Completely Flush Outside Diameter In addition to small diameter, low weight, and unusually high strength, Baash-Ross Small-Diameter Pipe Strings also feature a completely flush outside surface with no bulges or increased diameters to hang up or cause difficulties when working inside of other pipe strings. Note that there are no external beads or projections of any kind at the welded joint — and the tool joints are of the same outside diameter as the pipe — thus assuring an absolutely flush surface at all points.

Accessory Equipment To insure maximum adaptability and convenience in using Baash-Ross Small-Diameter Pipe Strings, the following accessory equipment is also available . . .



ELEVATOR PLUGS
These plugs are inserted into the top joint of the Small-Diameter Pipe String to provide a convenient elevator shoulder for supporting the string and handling the flush pipe sections. Made of heat-treated and hardened alloy steel, these Plugs are available with male thread only.

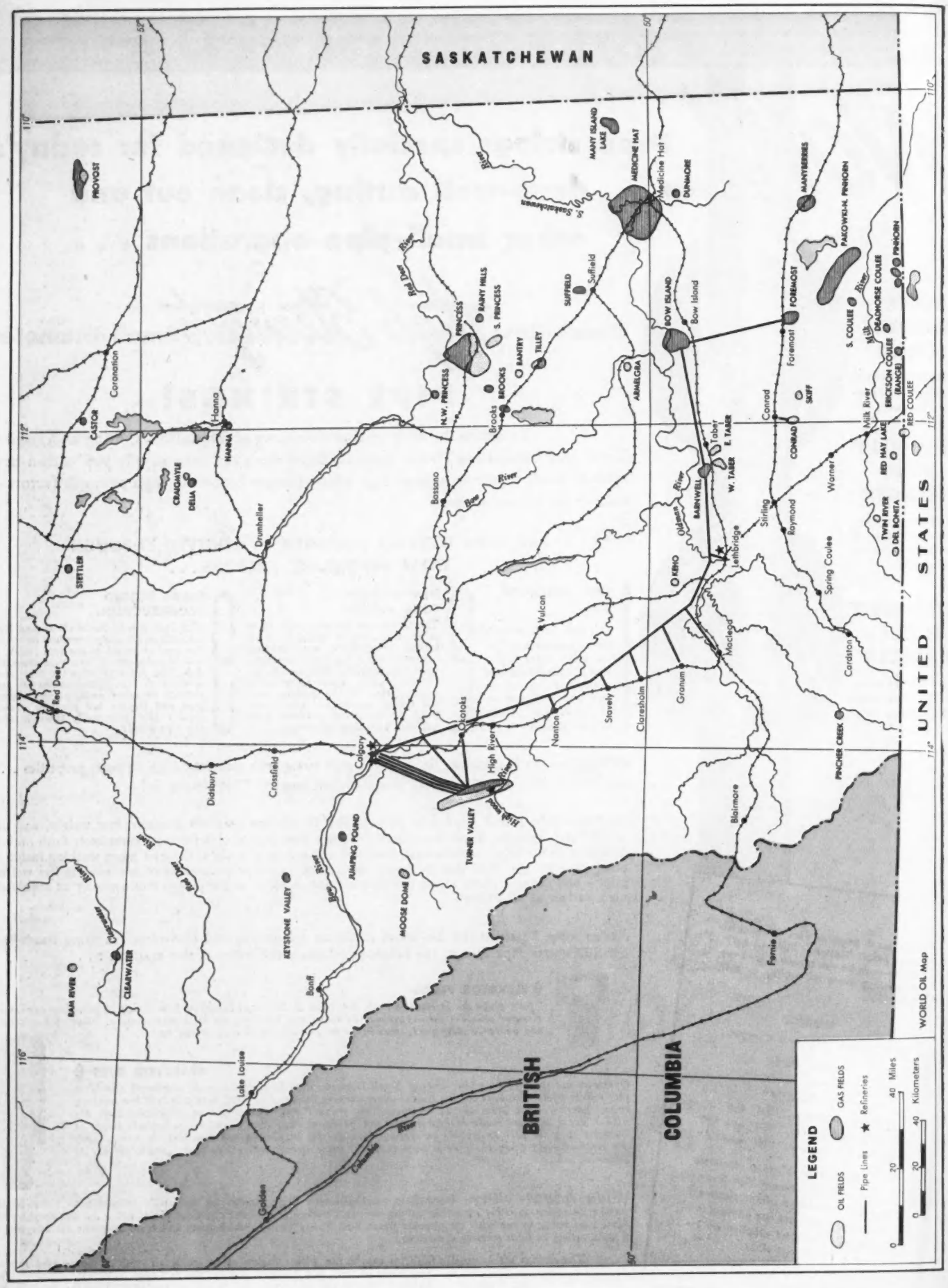
STABILIZER SUBS
Operators use these between the joints of Small-Diameter Pipe Strings to provide stabilizing shoulders that reduce friction on long cutting strings when working inside of internal flush pipe. (When working inside internal upset pipe, the upsets themselves provide stabilization and no stabilizing Subs are used.) These Subs are made of heat-treated and hardened alloy steel — and are sufficiently larger in diameter than the pipe to provide an elevator shoulder for supporting and handling the string. They are removed only when the pipe is used inside of other strings where clearance restricts the use of Stabilizer Subs.



Wide Adaptability Baash-Ross Small-Diameter Pipe Strings are unusually adaptable to virtually any small-pipe operation — for operating cutting strings, rotating small bits, clean-out tools, etc. . . . and they are the ideal pipe string to use with the popular Baash-Ross Power Swivel, which more and more operators are adapting to a wide variety of light rotating operations.

The Strings are externally flush, so can be run with complete safety inside all types of pipe — even internal upset pipe. They are available in a full range of sizes, but the most popular size is 1.660" in outside diameter. This size has the greatest range of adaptability since it can be run inside of any of the sizes of tubing or drill pipe indicated in the panel at left. ***Write for full details!***

CANADA—Southern Alberta Fields



Company completed its Pincher Creek discovery well early in 1948, the deepest producing well in Canada, with estimated potential of more than 1500 barrels of 55-57-gravity oil and 45 million cubic feet of gas a day. This discovery was in the Madison Limestone, the formation producing at Turner Valley, and in drilling to 12,156 feet, more than 400 feet of porosity and fracturing was found in the formation. This strike is being followed up by two tests on the flanks of the dome in the hope of picking up crude oil production such as was found on the west flank at Turner Valley.

Elsewhere in Alberta during 1948 there were smaller discoveries at Craigmyle by Socony-Vacuum Oil Company, at Hanna by Hanna Petroleums, Ltd., at Brooks by California-Standard Company, at Armena by Imperial Oil, Ltd., and at Baxter Lake by Pan-Western Oils Ltd. Natural gas fields were found at St. Paul and at Keystone Valley in addition to gas production or extensions of gas area at Medicine Hat, Viking-Kinsella, Foremost, Hanna and Vermilion.

These discoveries are the result of greatly increased activity on the part of both Canadian and American companies. During last year the number of active operators increased to more than 50, with some of the larger American independents joining many of the major companies in moving into the great Prairie regions.

The number of drilling rigs active in Alberta was only 20 at the beginning of 1947, climbed to 50 at the beginning of 1948, and by the end of that year 85 rigs were in operation. By the middle of March, 1949, the number had climbed to 100 and more were scheduled.

These rigs accounted for the greatest number of completions and the greatest footage in Canada's history. During the year there were 426 wells completed in Western Canada, 356 of which were in Alberta. This compares with a total of 314 completions in 1947 of which 195 were in Alberta. Of the total 1948 wells, 249 were oil producers, 22 gassers and 155 dry holes.

In Saskatchewan most of the past activity has been centered in the Lloydminster-Lone Rock area, but during 1948 there was an increasing tendency toward wildcatting. Wells were drilled as far as 100 miles south of Lloydminster, with Bata-Superior bringing in a discovery 24 miles south of Macklin as the first production for Saskatchewan outside the Lloydminster area itself. Wildcats were drilled 20 miles southeast of the above discovery, 40 miles northeast of Lloydminster, and elsewhere in western Saskatchewan.

Shortly after the beginning of 1949 an important oil discovery was indicated at Golden Spike, just 4½ miles west of the Woodbend field in Alberta.

In Eastern Canada, Imperial has extended its Becher field, opened in 1947, and this area has accounted for most of the increased production from that region. The Kimball field was also extended for oil production, and new gas wells have been found by Union Gas Company of Canada Limited in the western part of Elgin County, Ontario. Drilling has proceeded in the Haldimand and Welland fields of the

Data on Refineries in Eastern Canada

COMPANY	Location of Plant	Crude Charging Capacity, (Bbls. Daily)	Cracking Capacity, (Bbls. Daily)	Type of Refinery	Operating Status
New Brunswick:					
New Brunswick Oilfields, Ltd.	Weldon	250	....	Skimming	Operating
Nova Scotia:					
Imperial Oil Ltd.	Imperial (2 miles of Dartmouth)	34,000	11,600	S-C-A	Operating
Ontario:					
British American Oil Co., Ltd.	Clarkson (Toronto)	8,250	4,500	Complete	Operating
	Toronto	6,000	3,000	Skim-Crk	Operating
Burlington Refineries, Ltd.	Hamilton	600	.....	Skimming	Shut Down
Canadian Oil Companies, Ltd.	Petrolia	3,500	1,500	S-C-L-W	Operating
Good Rich Refining Co., Ltd.	Port Credit (Toronto)	4,000	1,300	Skim-Crk	Operating
Imperial Oil Ltd.	Sarnia	41,500	20,000	Complete	Operating
McColl-Frontenac Oil Co., Ltd.	Toronto	13,000	3,300	Skim-Crk	Operating
Quebec:					
British American Oil Co., Ltd.	Montreal	17,000	7,500	S-C-A	Operating
General Petroleum Refineries	Pointe-aux-Trembles (Montreal)	300	.....	Skimming	Shut Down
Imperial Oil Ltd.	Montreal	25,000	9,800	S.C.L.A.	Operating
McColl-Frontenac Oil Co., Ltd.	Montreal	20,000	12,500	Skim-Crk	Operating
Shell Oil Co. of Canada, Ltd.	Montreal	10,000	7,500	Skim-Crk	Operating

Oil Production and Producing Wells in Eastern Canada

Province, Township and Field	Year of Discovery	Producing Oil Wells End of 1948			Year 1947	Year 1948	Cumulative Through 1948
		Flowing	Art. Lift	Total Prod.			
New Brunswick:							
Stoney Creek	1912	..	28	28	23,128	21,371	434,657
Ontario:							
Becher	1947	..	31	31	20,264	59,846	82,457
Bothwell and Thamesville	1895	..	192	192	14,260	15,238	2,795,498
Dawn and Euphemia	1932	..	3	3	163	7,312	65,939
Dover, Raleigh and Romney	1917	..	16	16	4,545	3,830	212,175
Dunwich	1898	..	23	23	1,730	1,821	198,041
Moore	1904	..	8	8	132	544	434,976
Mosa	1904	..	169	169	19,165	18,341	530,486
Oil Springs	1861	..	491*	491*	25,683	26,164	8,106,347
Onondaga	1910	..	..	..	80	69	.....
Petrolia and Enniskillen	1865	..	†	†	37,458	40,602	26,296,622
Plympton	1875	..	..	..	.....	8	.....
Sarnia	.....	..	6	6	80	124	315,204
Tilbury, W.	1947	..	9	9	.....	609	609
Warwick, Metcalfe and Adelaide	1938	..	13	13	2,390	2,479	118,869
Total			989	989	149,078	198,358	39,591,880

* Includes Petrolia producing wells.
† Included with Oil Springs.

Data on Refineries in Western Canada

COMPANY	Location of Plant	Crude Charging Capacity, (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Type of Refinery	Operating Status
Alberta:					
British American Oil Co., Ltd.	Calgary	5,500	2,500	S-C-A	Operating
Excelsior Ref., Ltd.	Lloydminster	1,000	.....	Skimming	Operating
Gold Standard Oils, Ltd.	Wainwright	300	.....	Skimming	Operating
Imperial Oil Ltd.	Calgary	8,300	4,000	S-C-A	Operating
Imperial Oil Ltd.	Edmonton	6,500	.....	Complete	Operating*
Pacific O&R of Alberta	Lethbridge	2,000	.....	Skimming	Shut Down
Turner Valley Gas & Oil Refineries, Ltd.	Hartwell (Turner Valley)	2,200	1,000	Skim-Crk	Operating
British Columbia:					
Home Oil Distributors, Ltd.	N. Vancouver	2,000	.....	Skimming	Shut Down
Imperial Oil Ltd.	Ioco (Vancouver)	16,000	2,600	Complete	Operating
Shell Oil Co. of B.C.	Shellburn (Vancouver)	4,200	.....	Skimming	Operating
Standard Oil Co. of B.C.	Burnaby (Vancouver)	4,700	.....	Skim-Asphalt	Operating
District of Mackenzie:					
Northwest Co., Ltd.	Norman Wells	850	.....	Skimming	Enlarging
Manitoba:					
Anglo-Canadian Oils, Ltd.	Brandon	2,000	1,000	Skim-Crk	Operating
North Star Oil, Ltd.	St. Bonaface	2,000	750	S-C-A	Operating
Radio Oil Refining, Ltd.	Winnipeg	500	.....	Skimming	Operating
Trump Oil Co., Ltd.	Morris	250	.....	Skimming	Operating
Saskatchewan:					
British American Oil Co., Ltd.	Moose Jaw	5,200	2,500	S-C-A	Operating
Consumers Co-op. Refin.	Regina	1,500	500	Skim-Crk	Operating
HiWay Refineries, Ltd.	Moose Jaw	300	.....	Skimming	Operating
HiWay Refineries, Ltd.	Rosetown	275	.....	Skimming	Operating
HiWay Refineries, Ltd.	Saskatoon	300	.....	Skimming	Operating
Husky Refining Co.	Lloydminster	2,500	.....	Asphalt	Operating
Imperial Oil Ltd.	Regina	10,500	6,500	S-C-A	Operating
Northern Petroleum Corp.	Kamsack	200	.....	Skimming	Operating
Sterling Refineries, Ltd.	Yorkton	750	.....	Skimming	Shut Down

*This complete refinery moved from Whitehorse.

"LAY THAT PISTOL DOWN!"

Sure, oil exploration costs can be high . . . but you don't need such a drastic solution! A Mayes-Bevan Gravity Meter Survey gives you a reliable preliminary investigation that is ECONOMICAL! High priced, detailed exploration techniques are out of the question over a large potential producing province. Mayes-Bevan has the answer. Let them localize your areas, indicating in just which LIMITED sectors further, more elaborate, explorations should be profitable. So lay that pistol down . . . and send for Mayes-Bevan!

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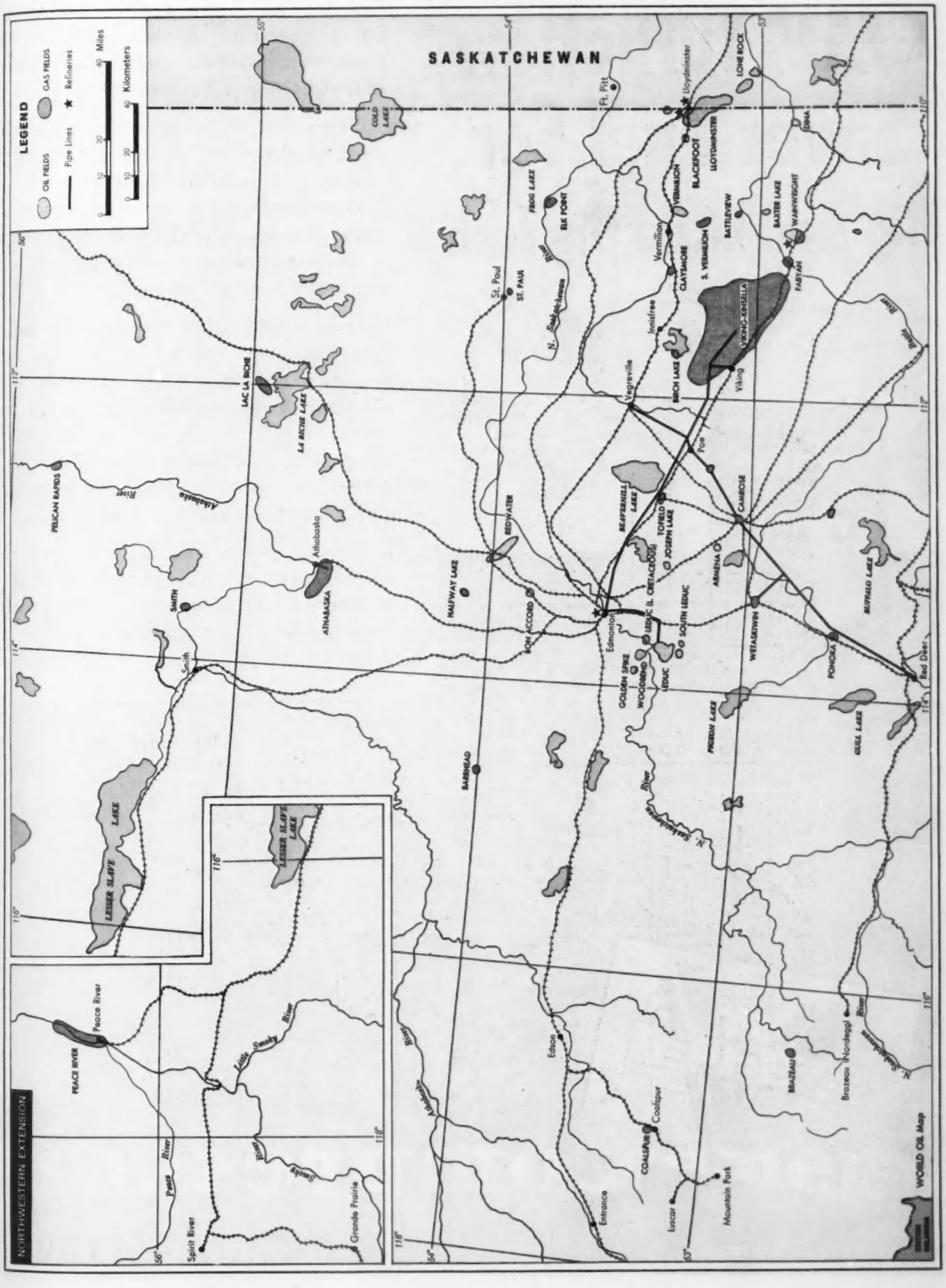
CANADA—Central Alberta Fields



GMV Turboflow Saves Fuel For Big And Little Big Inch

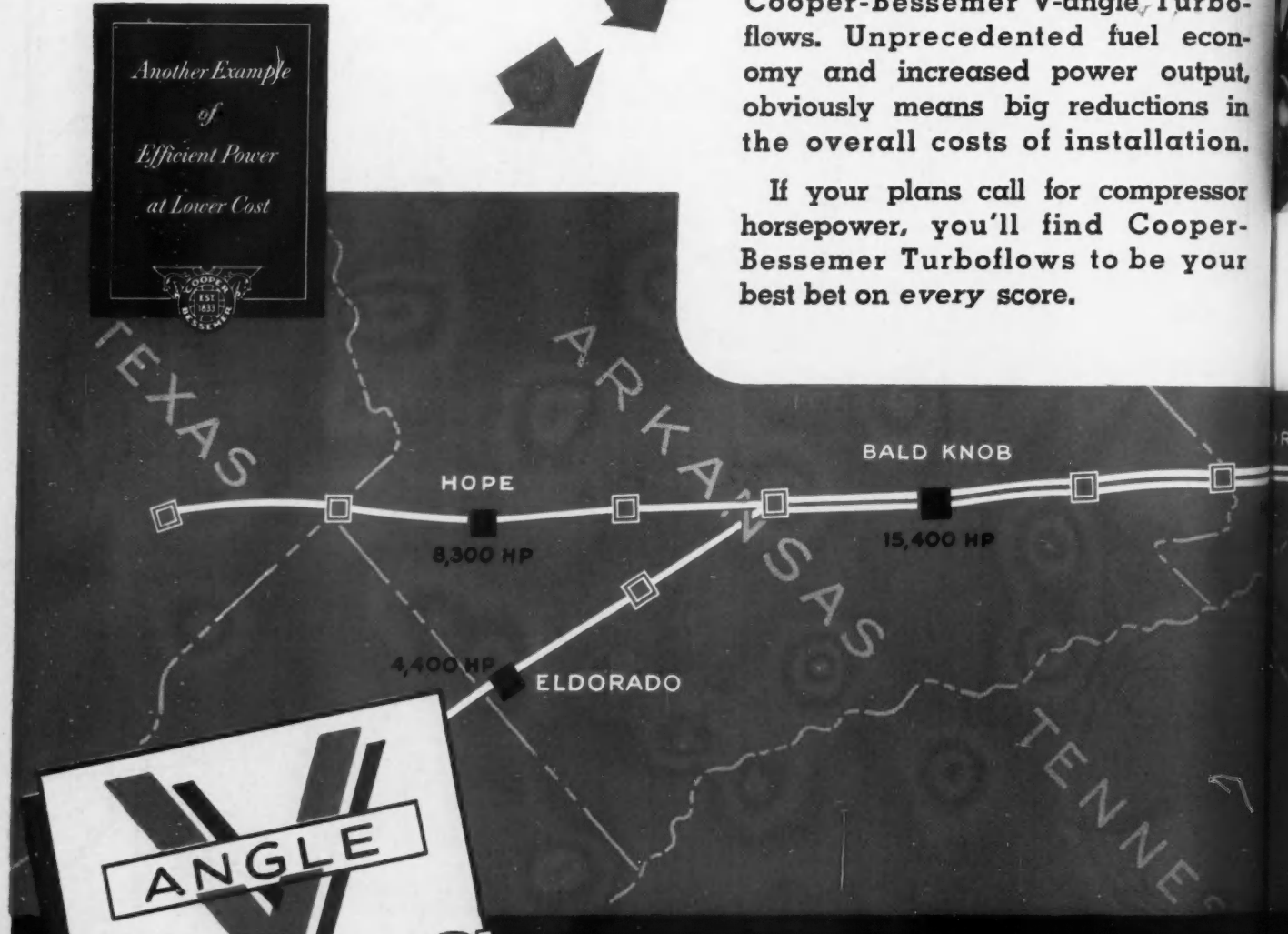
As indicated on this map of the Inch line, 5 of the 7 new stations powered by reciprocating engine-driven compressors are GMV-equipped — a total of 46,900 Cooper-Bessemer V-angle hp.

Of particular significance, the GMVs most recently furnished (29 of the 44 now on the lines) are *Turboflows* — Cooper-Bessemer's latest gas-engine development, affording a full 10% increase in power output while reducing fuel consumption by at least 15%.

Today, more and more of the big gas lines are taking advantage of the new savings made possible by Cooper-Bessemer V-angle Turboflows. Unprecedented fuel economy and increased power output, obviously means big reductions in the overall costs of installation.

If your plans call for compressor horsepower, you'll find Cooper-Bessemer Turboflows to be your best bet on *every* score.

Another Example of Efficient Power at Lower Cost



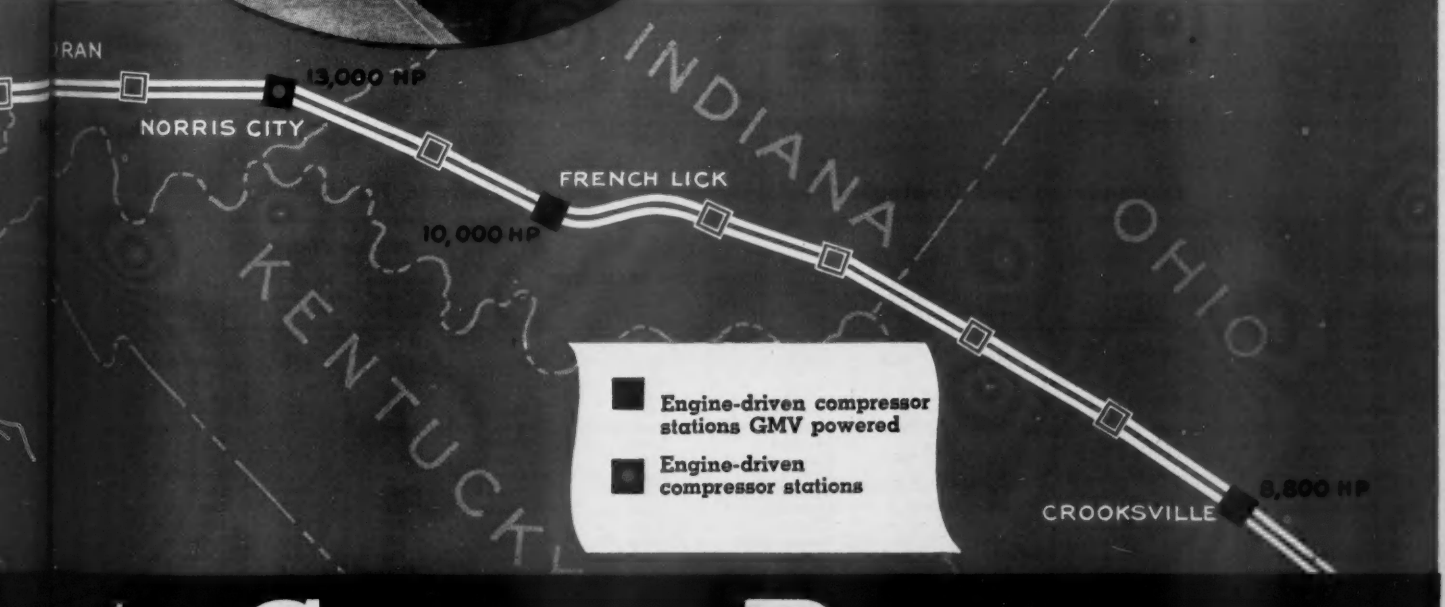
ANGLE

Compressors

New York Washington Bradford, Pa. Parkersburg, W. Va. San Francisco, Cal. Seattle, Wa Hou

• Overhead view of 14 Cooper-Bessemer GMVs during installation at Texas Eastern's Bald Knob, Arkansas, station. Total: 15,400 hp.

• GMV 10-cylinder compressors in Texas Eastern Transmission Corporation's Hope, Arkansas, station . . . 8,300 efficient horsepower.



s by **Cooper-Bessemer**

MOUNT VERNON, OHIO AND GROVE CITY, PENNA.

Houston, Dallas, Greggton, Pampa and Odessa, Texas Tulsa Shreveport St. Louis Los Angeles

CANADA—Continued

Engineering and Geological Data on Western Canada Fields

PROVINCE and FIELD	Est. Proved Area (Acres)	Gravity of Oil (API)	Local Name	Kind	Geologic Age	Depth of Wells (Ft.)		Average Thickness of Pay (Feet)	Type Structure
						Minimum Top Pay	Maximum Depth Wells		
ALBERTA:									
Armelgra	.....	18	Ellis	Sand	Jurassic	3100	....	..	Unknown
Armena	.....	38	Devonian	Lime	Devonian	4152	4174	..	Unknown
Athabaska	25,000	Gas	Labiche	Sand	Cretaceous	600	1300	..	Strat-Trap
Bantry	.....	24.7	Bantry	Sand	Cretaceous	3253	3270	..	Unknown
Barrhead	.....	24	Madison	Lime	Penn.	4008	4016	..	Unknown
Barnwell	5,000	Gas	Bow Island	Sand	Cretaceous	2150	....	10	Monocline
Bon Accord	.....	35	Devonian	Lime	Devonian	3585	3608	23	Unknown
Bow Island	10,000	Gas	Bow Island	Sand	Cretaceous	1900	2255	9	Dome
Brooks	2,500	Gas	Milk River	Sand	Cretaceous	1190	1250	100	Strat-Trap
Brooks	.....	27	Sunburst	Sand	Cretaceous	3300	3350	..	Unknown
Conrad	1,000	26	Ellis	Sand	Jurassic	2960	3125	13	Strat-Trap
Craigmyle	.....	34	Madison	Lime	Miss.	4024	4044	20	Unknown
Del Bonita	200	36–38	Madison	Lime	Miss.	5054	....	12	Anticline
Dina	400	14–15	Meridian	Sand	Cretaceous	1680	1900	15	Strat-Trap
Fabyan	200	Gas	Viking	Sand	Cretaceous	1585	1900	10	Strat-Trap
Foremost	5,000	Gas	Bow Island	Sand	Cretaceous	2050	2250	9	Anticline
Golden Spike	.....	38	Devonian	Lime	Devonian	5362	....	..	Coral reef
Hanna	.....	33	Sunbrust	Sand	Cretaceous	3700	3731	20	Strat-Trap
Joseph Lake	.....	37	Viking	Sand	Cretaceous	3264	3271	..	Unknown
Keho Lake	.....	32	Bow Island	Sand	Cretaceous	3680	....	5	Anticline
Keystone Valley	.....	Gas	Blairmore	Sand	Cretaceous	8500	....	..	Unknown
Kinsella-Viking	250,000	Gas	Viking	Sand	Cretaceous	2100	2200	10	Strat-Trap
Hay Lake	100	30	Madison	Lime	Miss.	3094	....	4	Dome
Jumping Pound	.....	46	Madison	Lime	Miss.	9900	....	300	Anticline
Lac la Biche	.....	Gas	Viking	Sand	Cretaceous	780	810	..	Unknown
Lac la Biche	.....	Gas	Devonian	Lime	Devonian	1544	1585	..	Unknown
Leduc–Woodbend	15,000	39	Devonian	Lime	Devonian	5000	5425	60	Coral reef
Leduc–Woodbend	500	39	Lower Cret.	Sand	Cretaceous	3590	4231	..	Unknown
Lloydminster-Lone Rock-Blackfoot	20,000	14–18	Sparky	Sand	Cretaceous	1750	2000	10	Strat-Trap
Medicine Hat	40,000	Gas	Medicine Hat	Sand	Cretaceous	900	1250	20	Strat-Trap
Moose Dome	200	47.7	Fairholme	Lime	Devonian	1534	....	..	Dome
Pakowki-Pinhorn	25,000	Gas	Bow Island	Sand	Cretaceous	2000	2200	..	Strat-Trap
Pincher Creek	.....	57 (wet gas)	Madison	Line	Miss.	11700	12500	400	Anticline
Princess	200	34.5	Devonian	Lime	Devonian	3980	4000	18	Dome
Princess	200	26–28	Sunburst	Sand	Cretaceous	3177	....	35	Strat-Trap
Princess	200	26	Madison	Lime	Miss.	3300	3320	5	Strat-Trap
Red Coulee	150	31.5	Vanalta	Sand	Cretaceous	2417	2475	30	Terrace
Redwater	15,000	35	Devonian	Lime	Devonian	3105	3303	146 (max.)	Coral reef
St. Paul	.....	Gas	Lower Cret.	Sand	Cretaceous	1547	1570	10	Unknown
Skiff	.....	....	Ellis	Sand	Jurassic	3054	3080	..	Unknown
South Princess	500	26–28	Madison	Lime	Miss.	3271	3326	20	Dome
Suffield	2,000	....	Medicine Hat	Sand	Cretaceous	980	1130	40	Strat-Trap
Stettler	.....	Gas	Sunburst	Sand	Cretaceous	4340	4348	..	Unknown
Taber	760	17–23	Taber	Sand	Cretaceous	3028	3260	23	Strat-Trap
Tilley	.....	27	Sunburst	Sand	Cretaceous	3170	....	10	Strat-Trap
Turner Valley	25,000	37–64	Madison	Lime	Miss.	3400	9600	450	Anticline
Twin River	.....	36.6	Madison	Lime	Miss.	3913	3964	..	Anticline
Vermilion	1,000	14	Vermilion	Sand	Cretaceous	1870	1980	5	Strat-Trap
Wainwright	12,000	22	Wainwright	Sand	Cretaceous	2200	2300	10	Anticline

Engineering and Geological Information on Eastern Canada Fields

PROVINCE AND TOWNSHIP	Proved Area (Acres)	Range of Gravity Oil (A.P.I.)	PRODUCING FORMATION			DEPTH—(Feet)		Type of Structure
			Name	Kind	Age	Minimum to Top of Pay (Ft.)	Maximum to Bottom of Pay (Ft.)	
New Brunswick:								
Stoney Creek	1,625	36.6	Albert	Sand	Miss.	1500	3200	Anticline-Monocline
Ontario:								
Bothwell	400	36	Onondaga	Lime	Devonian	395	410	Anticline
Brant	....	Gas	Medina-Cataract	Lime-Sand	Silurian	360	532	Monocline
Dawn	600	40	Onodaga	Lime	Devonian	320	370	Dome
	600	36	Guelph-Salina	Lime	Silurian	1600	1800	Dome
Declute	600	Gas	Guelph-Salina	Lime	Silurain	....	....	Anticline
Dover West	900	36	Trenton	Lime	Ordivician	2950	3300	Fault
Dunwich	500	Gas	Onondaga	Lime	Devonian	3300	400	Dome
Elgin	....	Gas	Clinton	Lime	Silurian	1250	1400	Monocline
Essex	2,000	40	Guelph-Salina	Lime	Silurian	900	1100	Anticline
Haldimand-Norfolk	145,000	Gas	Medina-Cataract	Sand-Lime	Silurian	350	900	Monocline
	18,900	Gas	Clinton	Lime	Silurian	870	1200	Lens
Kent	15,000	Gas	Guelph-Salina	Lime	Silurian	1200	1400	Dome
Lincoln	5,400	Gas	Medina-Cataract	Sand-Lime	Silurian	315	500	Monocline
Middlesex	200	Gas	Grimsby	Lime	Silurian	1450	1500	Monocline
Moore	500	Gas	Salina	Lime	Silurian	2150	2200	.....
Moss	4,000	Gas	Widder	Lime	Devonian	275	425	Dome
Oil Springs	750	38	Onondaga	Lime	Devonian	370	400	Dome
Onondaga	1,920	39	Medina-Cataract	Sand	Silurian	480	650	Monocline
Petrolia	8,000	36	Onondaga	Lime	Devonian	470	510	Anticline
Sombra Township	1,000	Gas and Oil	Salina	Lime	Silurian	1825	1900	.....
Tilbury	3,000	Gas	Guelph-Salina	Lime	Silurian	1050	1400	Anticline
Thamesville	300	Gas	Onondaga	Lime	Devonian	370	380	Anticline
Welland	38,000	Gas	Medina	Lime	Silurian	400	910	Monocline
Wentworth	6,000	.....	Clinton	Lime	Silurian	300	440	Monocline

CANADA—Continued

Niagara peninsula and a number of wildcats were drilled in Kent, Lambton and Essex counties with no discoveries of commercial value. Shell Exploration, New Brunswick, Limited, has continued its exploratory work in New Brunswick, keeping geological and geophysical crews in the field. It drilled two wildcats during the year, both of which were dry.

Plans are now under way for extensions to the Imperial refinery in Edmonton to increase capacity from the present 6500 barrels daily to 11,000 barrels a day by the end of 1949. It went into operation in August of 1948 after having been moved from Whitehorse in the Yukon. Meanwhile plans are under way for McColl-Frontenac Oil Company to build a refinery at Edmonton, and both Imperial and British American Oil Company plan to enlarge the capacities of refineries at Moose Jaw, Calgary, Regina and elsewhere in Western Canada.

During the past year Imperial has surveyed the route for its proposed pipe line from the Leduc area in Alberta to Regina, about 470 miles. The first plans called for a line to carry 40,000 barrels daily, but expansion of reserves in the area has already caused revisions in planning so that the line is now to be of 16-inch diameter with maximum capacity of 120,000 barrels a day. Steel has been allocated by the Canadian Government and pipe is now being rolled at mills in Eastern Canada. It is expected that the line will be finished in the summer of 1950, and will do much to facilitate expansion of the industry in the Prairie Provinces.

During 1948 plans were drafted for pipe lines to transport natural gas from Alberta to markets to the west and to the east. Several groups are now working to secure approval for such lines from Provincial and Federal governments. According to Alberta sources, the gas reserves of that province have been increased during 1948 to something better than 4 trillion cubic feet. The current local consumption of gas in Alberta now amounts to only about 40 billion cubic feet yearly, and anticipated further expansion of gas reserves is expected to aid materially in securing the necessary permits for lines to place the gas in the export market. One line is planned to carry gas eastward to Saskatchewan and Manitoba consuming centers, while another is projected from Alberta southward and eastward to serve markets in the northwestern U. S. and on the west coast of Canada. The most extensive of these is by the Northwest Natural Gas Company which proposes to build a 24-inch trunk line from southern Alberta fields, crossing into the U. S. at Kingsgate, and running through Spokane and Seattle and back into Canada as an 18-inch line to supply the Vancouver area. The entire system would include about 700 miles of line in the U. S. and as much more in Canada, and cost around $100 million.

Crude Oil Pipe Lines of Western Canada

COMPANY	Origin	Terminus	Length (Miles)	Diameter (Inches)	Year Completed	Status
Imperial Oil Ltd.	Leduc field	Nisku	8	8	1947	In use
Imperial Oil Ltd.	Nisku	Edmonton	20	8	1948	In use
Imperial Oil Ltd.	Leduc field	Moose Jaw and Regina	500	10	....	Planned
Valley Pipeline Company	Turner Valley	Calgary	30	4	1925	In use
Valley Pipeline Company	Turner Valley	Calgary	30	4	1937	In use
Valley Pipeline Company	Turner Valley	Calgary	31	6	1938	In use
Valley Pipeline Company	Turner Valley	(Gathering lines)	105	2, 3, 4	1945	In use
Standard Development Company	Conrad field	Conrad	5½	4	1945	In use
Standard Development Company	Princess field	Princess	3½	3	1945	In use

Natural Gas Pipe Lines of Western Canada

COMPANY	Origin	Terminus	Length (Miles)	Diameter (Inches)	Year Completed	Status
Canadian Western Natural Gas, Light, Heat & Power Company	Turner Valley	Calgary	28	10	1922	In use
Canadian Western Natural Gas, Light, Heat & Power Company	Turner Valley	De Winton	16	14	1922	In use
Canadian Western Natural Gas, Light, Heat & Power Company	Turner Valley	Okotoks	15	6	1922	In use
Canadian Western Natural Gas, Light, Heat & Power Company	Foremost	Bow Island	29.5	10	1912	In use
Canadian Western Natural Gas, Light, Heat & Power Company	Bow Island	Calgary	169.5	16	1912	In use
Canadian Western Natural Gas, Light, Heat & Power Company—						
(Branches on Bow Island, Calgary system, served from Turner Valley)	.....	Lethbridge	4.1	8	1912	In use
	.....	MacLeod	16.6	6	1915	In use
	.....	Granum	5.5	6	1915	In use
	.....	Claresholm	9.9	6	1920	In use
	.....	Stavely	3.3	3	1915	In use
	.....	Nanton	1.4	4	1915	In use
Northwestern Utilities, Ltd.	Viking	Edmonton	77.2	12¾ (Double)	1923	In use
Northwestern Utilities, Ltd.	Kinsella	Viking	10	10 & 12	1940	In use
Northwestern Utilities, Ltd., (Branch on Viking-Edmonton system)	.....	Vegreville	20	4	1930	In use
	.....	Ponoka	70	8	1946	In use
	Ponoka	Red Deer	30	6	1946	In use
Franco Utilities, Ltd.	Vermilion field	Vermilion	5	4	1943	In use
Wainwright Gas Company	Fabyan	Wainwright	7½	4	1927	In use

Natural Gas Pipe Lines of Eastern Canada

COMPANY	Origin	Terminus	Length (Miles)	Diameter (Inches)	Year Completed
New Brunswick:					
Moncton Electricity and Gas Co.	Stoney Creek	Moncton	8	10	1912
Ontario:					
Dominion Natural Gas Co.	Tilbury	Hamilton	175	12, 10, 8	1912
	Tilbury	Kingsville	30	8	1912
	Haldimand	Hamilton	(2) 50	10	1910
Union Gas Co. (Canada)	Haldimand	Hamilton	50	8	1936
	Dawn	London	60	10	1935
	Tilbury	Windsor	50	(2) 10	1906
					1908
	Tilbury	Sarnia	55	10	1910

EXPLORATION DRILLERS:

...here's how HAWTHORNE BITS MORE THAN DOUBLED DRILLING SPEED!

Drilled 4500 extra feet per month
Saved $419.50 in bit costs per month
Cut drilling costs from .69 to .27 per foot

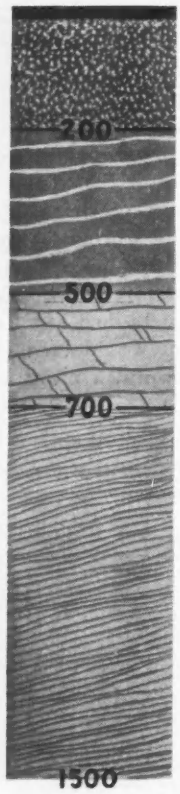
SOFT—clay, sandy clay, sand and gravel
(Hawthorne "Rock Cutter" Bits drilled 60 to 80 ft. per hr.)

SOFT—red beds with gypsum streaks,
(Hawthorne "Rock Cutter" Bits drilled 60 to 80 ft. per hr.)

VERY HARD — Blaine gypsum
(Hawthorne "Rock Cutter" Bits drilled 8 to 15 ft. per hr.)

MEDIUM HARD—red beds, hard gypsum streaks, salt streaks
(Hawthorne "Rock Cutter" Bits drilled 30 to 45 ft. per hr.)

Average drilling time 35 hrs. per hole



In a recent cost analysis of exploration drilling in the all-formation Shattuck-Woodward area, Oklahoma, extensive tests were run using both conventional roller bits and Hawthorne "Rock Cutter" Bits *under identical conditions.*

Consider these amazing results: Hawthorne "Rock Cutter" Bits more than doubled drilling speed, reduced bit costs 65% and reduced cost per foot 60%.

Faster drilling with Hawthorne "Rock Cutter" Bits paid important *extra* dividends, too. Slower drilling with roller bits caused side-walls to become soaked and to cave in unless quantities of costly drilling mud were used. Hawthorne Bits eliminated need for mud and enabled crews to run electric log without difficulty.

LOOK AT THESE DRILLING COST COMPARISONS

HAWTHORNE BITS vs. ROLLER TYPE BITS

	Average Bits per Hole	Holes per Month	Total Bit Costs per Month	Total Footage per Month	Total Drilling Costs per Foot
Roller Bits	4	4	$640.00	6,000 ft.	$ .69
Hawthorne Bits	2	9	$220.50	13,500 ft.	.27

The above figures show an average saving in drilling costs of $0.42 per foot—a total saving in bit costs of $419.50 per month, resulting from exclusive use of Hawthorne "Rock Cutter" Bits.

The Shattuck-Woodward area was selected for this test because it is a typical, all-formation area. Similar—often greater—savings with Hawthorne Bits are being effected daily in many other areas.

● ***See Composite Catalog or Geophysical Directory for lists, parts, prices — or write for illustrated catalog.***

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MEXICO

MEXICO, despite an increase in production which brought output to 159,481 barrels a day for the highest production since 1927, finds itself in the position of needing still greater expansion of production in order to maintain its balance of trade.

To this end drilling activity has been accelerated, with an increasing amount of attention given to exploration in an effort to find new sources of production. That the program is gaining momentum is evidenced by the 80 wells drilled in 1948 compared with 50 in 1947, and the fact that enough drilling equipment is now operating to assure another substantial increase in 1949. At the close of the year there were 40 rigs in operation, 12 of which were engaged in exploratory drilling, and a number of the remainder were engaged in the development of recently discovered areas.

Among such areas is the Reynosa field in northeastern Mexico, where six wells have been drilled since the completion of the discovery well in February, and which has very good prospects for adding substantially to the nation's production, although currently the field is limited to the available transportation, now taking care of approximately 1500 barrels daily. The field produces high-gravity oil and has a high gas potential. Other development in the vicinity includes the Misión gas field, newly connected by pipe line, where two rigs are running, and the new Camargo field also in the process of development.

Northwest of Cerro Azul in the Golden Lane region, five new wells have been drilled in the Moralillo field, and had attained a producing rate near 2000 barrels daily early in 1949. In the Isthmus of Tehuantepec, a new area is being developed near the Minatitlan refinery where some small wells capable of producing from 100 to 150 barrels daily from depths just below 2000 feet are being drilled in the new Moloacan area. Otherwise, development has been limited to the older producing regions, with some attention to step-out and extension drilling.

The Poza Rica field has been called upon for the bulk of the increased production from Mexico during 1948, after small increases in the Northern areas plus the output from Reynosa field had about balanced the decline in the Isthmus. However, Poza Rica seems able to produce the added volume without injury.

The principal cause for concern is the increasing domestic consumption in Mexico which leaves successively less crude

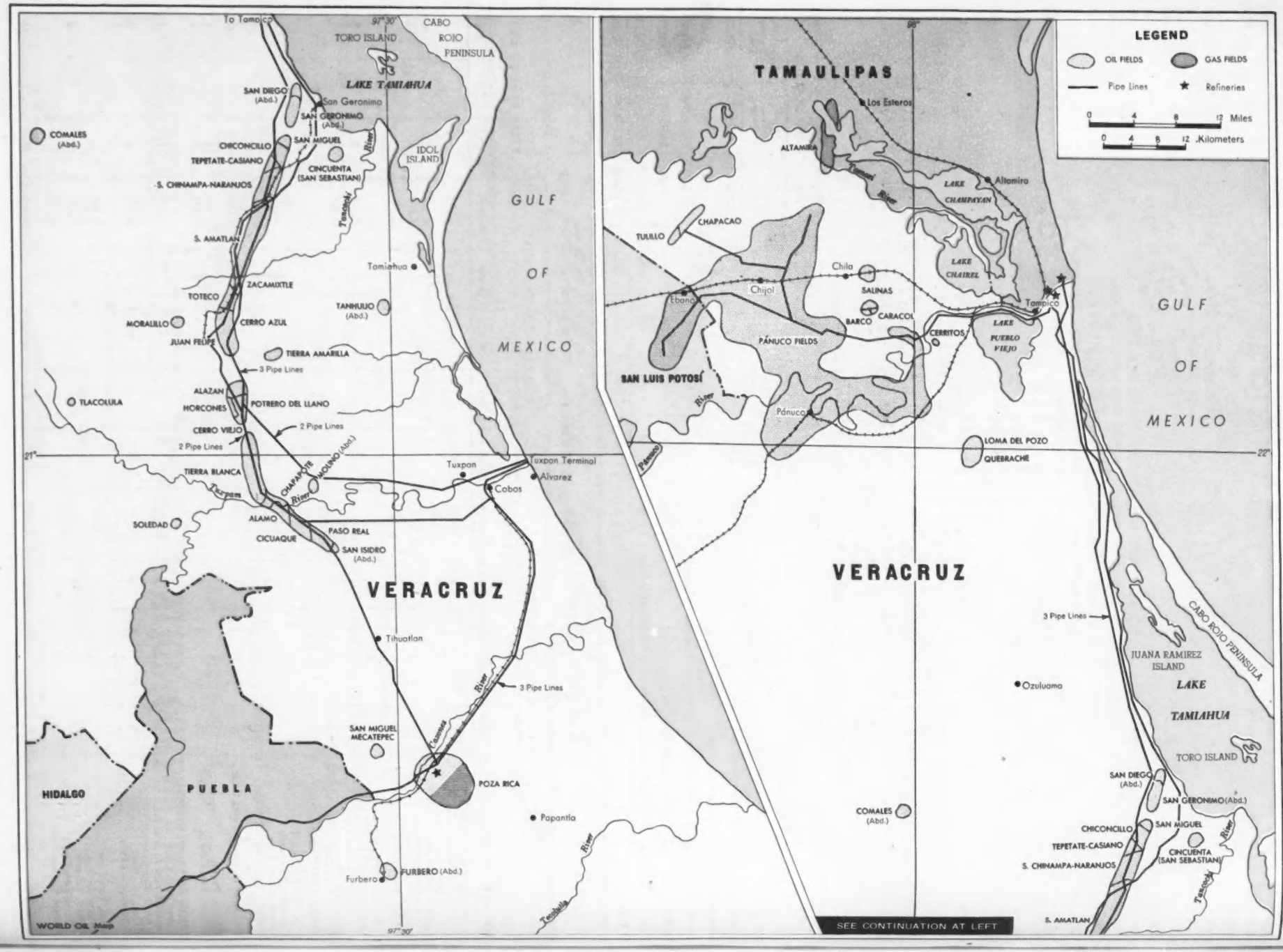
Oil Production and Producing Wells in Mexico

STATE	COMPANY	Year of Discovery	OIL WELLS AT END OF 1948			CRUDE OIL PRODUCTION (Barrels)			
			Shut In	Producing	Total	Daily At End 1948	Year 1947	Year 1948	Cumulative Through 1948
Isthmus	Petróleos Mexicanos	1921	65	220	285	16,523	6,368,896	6,056,371	153,414,330
Northeastern	Petróleos Mexicanos	1948	1	7	8	1,518	.....	85,401	85,401
Northern	Petróleos Mexicanos, Mexican Gulf Oil, Miscellaneous	1901	122	561	683	27,465	10,028,235	10,205,230	801,341,135
Poza Rica	Petróleos Mexicanos	1930	20	71	91	94,890	31,718,942	34,307,792	327,828,177
Southern	Petróleos Mexicanos, Mexican Gulf Oil, Miscellaneous	1908	54	193	247	20,738	7,801,322	7,715,392	1,089,103,140
Total		....	262	1052	1314	161,134	55,917,395	58,370,186	2,371,772,183

Drilling in Mexico

STATE and FIELDS	WELLS COMPLETED IN 1947					WELLS COMPLETED IN 1948					WELLS DRILLING AND SHUT DOWN 1948		
	Oil	Gas	Dry	TOTAL Wells	TOTAL Footage	Oil	Gas	Dry	TOTAL Wells	TOTAL Footage	Drilling	SD	Total
NORTHEASTERN DISTRICT:													
Camargo, Tamaulipas	..	1	1	2	3,616	..	..	3	3	9,433	..	..	..
Misión, Tamaulipus	..	..	3	3	20,925	..	..	1	1	2,821	..	..	..
Reynosa, Tamaulipas	..	..	..	..	.....	4	1	..	5	29,526	2	1	3
Wildcats, Chihuahua	..	..	1	1	8,480	..	..	1	1	8,514	1	..	1
Wildcats, Nuevo-Leon	..	..	1	1	5,817	..	..	..	..	.....	..	..	..
Wildcats, Tamaulipas	..	1	1	2	12,490	..	1	1	2	17,813	2	..	2
NORTHERN DISTRICT:													
Cacalilao, Cacalilao	..	..	..	..	.....	3	..	..	3	5,748	2	..	2
Chapacao, Vera Cruz	1	..	1	2	4,352	2	..	1	3	5,840	..	2	2
Limón, Vera Cruz	1	..	..	1	2,713	1	..	4	5	14,487	1	..	1
Wildcats, Vera Cruz	1	..	2	3	8,458	..	..	..	..	.....	..	..	..
Wildcats, Tamaulipas	..	..	..	..	.....	..	..	..	..	.....	1	..	1
SOUTHERN DISTRICT:													
Chiconcillo, Chiconcillo	..	..	..	..	.....	1	..	..	1	2,231	..	..	..
Chinampa, Vera Cruz	..	..	..	..	.....	..	..	3	3	6,750	1	..	1
Moralillo, Vera Cruz	..	..	..	..	.....	5	..	3	8	43,378	3	..	3
Poza Rica, Vera Cruz	8	..	1	9	66,802	8	..	3	11	85,671	2	..	2
San Miguél-Mecatepec, Vera Cruz	..	..	1	1	7,313	3	..	..	1	4,140	1	..	1
Wildcats, Puebla	..	..	..	..	.....	..	..	1	1	4,140	1	..	1
Wildcats, Vera Cruz	1	..	4	5	40,568	..	..	7	7	53,821	5	..	5
ISTHMUS OF TECHUANTEPEC:													
Acalapa, Vera Cruz	..	..	..	..	.....	1	..	..	1	4,905	1	..	1
Cuichapa, Vera Cruz	1	..	..	1	2,152	..	..	..	..	.....	..	..	..
El Burro, Vera Cruz	..	..	..	..	.....	..	..	3	3	12,182	..	..	..
El Plan, Vera Cruz	9	..	3	12	75,637	9	..	2	11	59,747	4	2	6
Moloacan, Vera Cruz	..	..	..	..	.....	..	..	..	..	.....	1	..	1
Tonolá, Vera Cruz	..	..	1	1	3,311	..	..	1	1	3,291	..	..	..
Wildcats, Acalapa	..	..	..	..	.....	1	..	..	1	2,368	..	..	..
Wildcats, Tabasco	..	..	3	3	15,416	..	1	2	3	17,893	2	1	3
Wildcats, Vera Cruz	1	..	2	3	8,673	1	..	..	1	2,124	..	..	..
Wildcats, Gavilan-Norte	..	..	..	..	.....	1	..	..	1	8,049	..	..	..
Total	23	2	25	51	286,723	40	3	37	80	420,905	29	6	35

MEXICO—Pánuco and Golden Lane Fields



MEXICO—Continued

oil and products for export. Although total exports during the year averaged slightly more than 35,000 barrels daily, there were imports of special products from the U.S. amounting to 13,000 barrels daily. With oil a principal source of dollar exchange, the overall situation has been one of alarming implications to Mexican economists.

Early in 1949 the most encouraging action took place when the Mexican American Independent Oil Company reached an agreement with the Mexican authorities whereby it would start exploration in southern Mexico, though such operations will be carried on without the company's having acquired any title to the subsoil. It will explore for oil on what amounts to a percentage basis, bearing all of the expense of wildcat operations with provisions for recovering the expense out of production on tracts where commercial oil is found. Mexican American Independent is a firm participated in by The Edwin Pauley interests, Signal Oil Company, and American Independent Oil Company.

Data on Mexico Refineries

District and Company	Location of Plant	Crude Charging Capacity (Barrels Daily)	Cracking Capacity (Barrels Daily)	Type of Refinery	Operating Status
Northern Mexico					
Pemex	Nuevo Laredo	330	None	Skim.	Operating
	Nuevo Laredo	190	None	Skim.	Operating
	Monterrey	160	None	Skim.	Operating
	Cuidad Juarez	1,000	None	Skim.	Operating
Tampico					
Pemex	Cuidad Madero	55,000	8,500	Complete	Operating
	Arbol Grande	20,500	None	S-L-W-A	Operating
	Mata Redonda	11,500	5,500	Skim-Crk.	Operating
Poza Rica					
Pemex	Poza Rica	6,400	None	Skim.	Operating
Central Mexico					
Pemex	Atzcapotzalco (Mexico City)	50,000	None	Complete	Operating
	Salamanca	30,000	None	Skim.	Planned
Isthmus					
Pemex	Minatitlan	27,500	2,500	Complete	Operating
Total Operating	11 Plants	172,589	16,500	.....	.....

Pipe Lines of Mexico

COMPANY	Origin	Terminus	Length (Miles)	Number of Lines, Pipe Sizes and Loops	Capacity	Status
CRUDE LINES						
Petróleos Mexicanos	Ebano-Pánuco Fields	Tampico	35	Combination 8" & 10" with 22 miles of 10" loop	30,000	In use
	Ebano-Pánuco Fields	Gathering and branch lines to main trunk line	144	4", 6", & 10"		
	Poza Rica	Mexico City	147	One 10"	50,000	In use
	Poza Rica	Salamanca	287	12"	30,000	Building
	Poza Rica	Tuxpan	39	One 6", one 8", and one 12" with 12 miles of loop	125,000	In use
	Tuxpan	Potrero	33	Two 8"	50,000	In use
	Cobos (Tuxpan)	Alamo	20	One 8"	25,000	In use
	Alamo	Tampico	103	Combination 8" & 10" with 11 miles of loop	24,000	In use
	Poza Rica	Alamo	35	One 12"	63,000	In use
	Alamo	Potrero	14	One 8" & one 10"	75,000	In use
	Potrero	Chijol (Tampico)	87	Three 8"	72,000	In use
	Tonalá Field	Minatitlan Refy.	35	Combination 8", 10" & 12"		
	El Plan Field	El Chapo Station	21	Combination 8", 10" & 12"		
	El Chapo Station	Nanchital	6	One 10"	30,000	In use
	Cuichapa	El Plan-El Chapo	3	One 8"		
PRODUCTS LINES						
Petróleos Mexicanos	Minatitlan	Salina Cruz	155	8"	.....	Planned
	Tonalá	Nanchital	23	3"	.....	In use
NATURAL GAS LINES						
Compañía Mexicana de Gas, de Monterrey	Roma	Monterrey	96	12"	50 mil. cu. ft.	In use
	Misión	Roma-Monterrey	37	12"	30 mil. cu. ft.	In use
Gas Industrial de Monterrey, S.A.	Reynosa	Monterrey	135	14"	50 mil. cu. ft.	In use
Petróleos Mexicanos	Poza Rica	Mexico City	150	20"	30 mil. cu. ft.	In use

Engineering and Geological Data on Mexico Fields

FIELD and STATE	Est. Proved Area (Acres)	Gravity of Oil (API)	PRODUCING FORMATION			Depth of Wells (Ft.)		Average Thickness Pay (Ft.)	Type Structure
			Name	Kind	Age	Minimum Top Pay	Maximum Total Depth		
NORTHEASTERN MEXICO:									
La Presa, **Tamaulipas**	.....	Gas	Mt. Selman	Sand	Eocene	1925	3160	38	Anticline
Mier, **Tamaulipas**	.....	Gas	Mt. Selman	Sand	Eocene	2120	2345	....	Nose
Misión, **Tamaulipas**	.....	Dist.	Vicksburg	Sand	Lwr. Olig.	....	6040	....	Anticline
Rancherias, **Tamaulipas**	1,230	Gas	(Fayette Yegua Cook Mt.	Sand	Eocene	264	2440	310	Anticline
Reynosa, **Tamaulipas**	.....	Dist.	Vicksburg	Sand	Lwr. Olig.	4625	8114	....	Anticline
TAMPICO AREA:									
Poza Rica, **Vera Cruz**	15,850	30	Tamabra	Lime	Lwr. Cre.	7250	7546	296	Nose
Northern District, **Ver.-Tamps.** (Ebano, Pánuco, etc.)	100,000	12	Tamaulipas	Lime fractures	Lwr. Cre.	1148	1968	*	Faulted Ant.
Southern District, **Vera Cruz,** (Golden Lane)	33,000	20	El Abra	Lime reef	Lwr. Cre.	2200	2202	†	Faulted Ant.
Soledad, **Vera Cruz**	.....	40	Tamabra	Lime	Lwr. Cre.	6435	6480	10	Nose
ISTHMUS OF TEHUANTEPEC:									
Cuichapa, **Vera Cruz**	300	30	Concepción Inferior	Sand	Miocene	2100	2133	33	Faulted dome
El Burro, **Vera Cruz**	370	26	Concep. Inf.; Encanto	Sands	Miocene	2460	2620	62	Salt dome
El Plan, Lignitic Zone, **Vera Cruz**	830	24	Cedral, Lignitic	Sands	Miocene	1970	2440	216	Faulted Ant.
El Plan, Concepción, **Vera Cruz**	250	30	Concep. Inf.; Sup.	Sands	Miocene	5734	5865	131	Dome
El Plan, East Extension, **Vera Cruz**	80	35	Concep. Inf.; Encanto	Sands	Miocene	3883	4110	32	Faulted nose
Filisola, **Vera Cruz**	460	22	Encanto	Sand	Miocene	1585	1980	92	Fltd. terrace
Nuevo Teapa, **Vera Cruz**	40	36	Encanto	Sand	Miocene	429	711	29	Salt dome
Tonalá, **Vera Cruz**	470	28	Concep. Inf.; Encanto	Sands	Miocene	1640	2130	167	Salt dome
			Deposito	Sand	Oligocene				

* Production from fractures in first 800 feet of Tamaulipas and San Felipe limes.

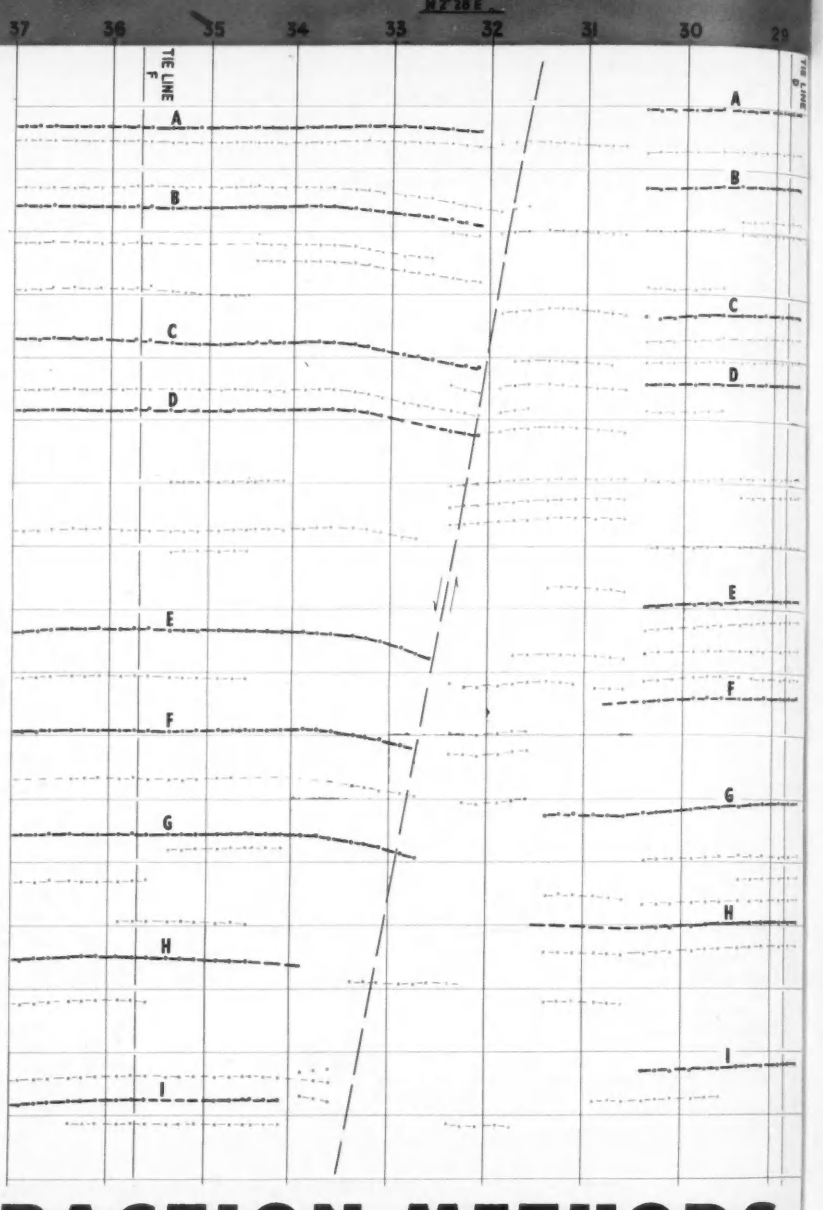
† Wells go into reef-phase limestone only about 2 feet.

INCREASING THE RESOLVING POWER OF THE REFLECTION SEISMOGRAPH

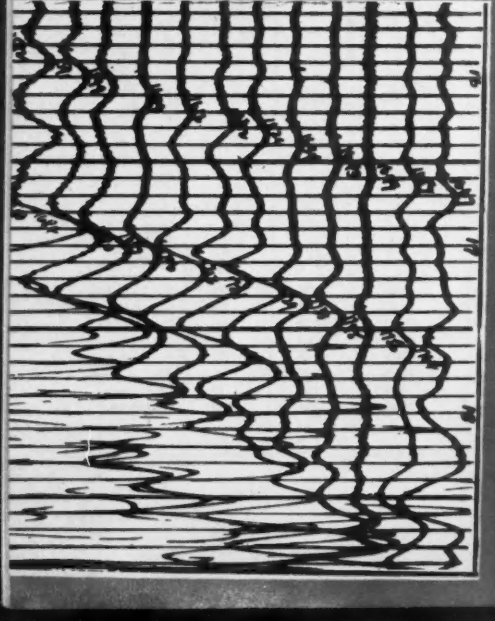
A new method of computation eliminates personal errors and increases precision, thereby increasing the resolving power of the reflection seismograph to the point where small faults and structures, as well as pinchouts, can be better delineated with greater accuracy.

By this method we compute from 6 to 12 depths from each shot point for every horizon. While the client has the advantage of this increased information, the cost is not increased, because one man does the computing with the aid of a machine. This method does not increase the cost of field work.

A means has been developed for obtaining weathered layer corrections for each detector. Inquiries are invited from those desiring complete information about this method of increasing the resolving power of the reflection seismograph.



MULTIPLE REFRACTION METHODS



The multiple refraction method is of particular value in areas where the reflection method is not easily applicable. This, in general is true of Southern Florida, Southeast Colorado, and Western Oklahoma. Multiple refraction methods have a distinct advantage over reflection methods in areas covered by caliche or other broken material.

Leonard J. NEUMAN
GEOPHYSICAL COUNSELOR & CONTRACTOR
OFFICE 942 Mellie Esperson Bldg.
HOUSTON · TEXAS

UNITED STATES

OIL operations in the United States rose to all-time high levels during 1948. Production of crude oil, natural gas, natural gasoline and refined products attained new peaks; as did pipe line construction, drilling, and exploratory activities.

So great was the volume produced and refined, the industry's supply shortage problems were completely overcome. Despite supplying a substantially larger consumption than ever before, oil stocks rose sharply to quite high levels. By the end of 1948 stocks of all oils exceeded 600 million barrels, an amount 102 million barrels or 1/5 greater than at the end of 1947. The accumulation of stocks was equivalent to a daily average addition of 280,000 barrels, with most of the inventory growth occurring the latter part of the year. Stocks of refined products rose 78½ million barrels during the year, while stocks of crude oil were increasing only 18 million barrels.

Crude oil production reflected an extraordinarily large increase, rising 424,000 barrels per day above the 1947 peak. Daily average output was 5,509,000 barrels, compared with 5,085,000 per day in 1947, and with 4,475,500 barrels in 1946. Annual yield amounted to a total of 2,016,200,000 barrels in 1948, the first time any nation ever produced 2 billion barrels in a year. Largest increase occurred in Texas, which produced 2,466,900 barrels daily, thus contributing 222,000 barrels more per day than in 1947, or slightly over half of the gain recorded by the nation.

The natural gas industry of the United States also continued its spectacular growth. Marketed production of natural gas totaled 4.9 trillion cubic feet during 1948, an increase of a half a trillion cubic feet over 1947.

Natural gasoline output was up 9.4 percent over the preceding year, amounting to a daily average of 395,527 barrels as compared with 361,647 barrels in 1947.

The record supplies of petroleum made available to the nation through peak production of crude oil and natural gasoline were further increased by importation of greater quantities of oil produced in other countries. U. S. imports in 1948 averaged 505,000 barrels daily, in contrast with 437,200 barrels in 1947.

Record importation rates resulted in the U. S. becoming a net importer, for the first time since 1923. Exports from the country declined from 450,600 barrels daily in 1947 to 374,500 barrels daily in 1948, an amount which was 130,500 barrels per day less than imports.

Encouraged by the high producing rate and increased price of crude oil, drilling rose sharply to boost U. S. completions and the amount of footage drilled to the highest levels in history. A total of 39,319 wells were completed in the nation in 1948, an increase of 5521 wells over the 1947 volume. This completion rate topped the previous record-high completed in 1937 by over 4000 wells. Completions included 36,659 new wells seeking oil or gas production, 2144 service wells, and 651 old wells drilled deeper.

Drilling included the most intense campaign ever attempted to find new oil and gas sources, a new all-time high of 6827 exploratory wells completed in the year topped the previous record of 5874 drilled in 1947 by more than 16 percent.

The wildcatting campaign achieved a fairly high degree of success. The year's exploratory drilling resulted in the opening of 601 new oil fields and 283 new oil pay horizons in previously established fields for a total of 884 new oil producing sources. In addition, 115 new distillate fields and pays and 140 new gas producing fields and pays were found.

The active drilling campaign resulted in the completion of 21,761 new producing wells, which exceeded the number of wells abandoned and shutin by 11,441. Consequently, the U. S. had 439,963 producing oil wells at the end of the year. Despite the large gain in number of producing wells, the increase in production was sufficient to boost the nation's average production per well from 11.9 to 12.7 barrels.

The necessity of moving larger quantities of products to markets resulted in record-breaking pipe line construction activity. A total of 14,821 miles of new pipe line was placed in operation during the year, compared with the former peak of 7953 miles reached in 1947.

Construction of natural gas was particularly active, accounting for 7414 miles of the new lines put into operation. New oil pipe lines which were completed during the year amounted to 5669 miles, while product line construction totaled 1738 miles.

Refinery operations rose sharply, crude runs to stills being 9.4 percent or 476,000 barrels per day above 1947 levels in averaging 5,551,000 barrels daily. Completion of new refining facilities made possible the processing of a record amount of crude oil in 1948. U. S. refining capacity at the end of the year totaled 6,076,000 barrels daily compared with 5,671,000 barrels in 1947.

Data on U. S. operations are not presented in this issue because they were covered so thoroughly in the Review-Forecast Issue of February 5, 1949. Readers are referred to that issue for information on the U. S. A partial list of the data contained in the Review-Forecast Issue is presented in the table below.

Index to U. S. Operating Data Published in World Oil's Review-Forecast Issue, February 15, 1949

DRILLING OPERATIONS:
- Completions (oil, gas, distillate, dry and total) by states in 1948 108
- Drilling depth records, by states, at end of 1948 111
- Drilling forecast, by states, for 1949 96
- Footage drilled, by states, in 1948 108
- Footage drilled forecast, by states, for 1949 96
- Rigs running, by states, end of each month in 1948 124
- Wells drilling, by states, end of each month in 1948 124
- Wildcats completed, by states, in 1948 78-79

FOREIGN TRADE:
- Imports-exports, by years, for all oils, crude oil and refined products 64-65

PIPE LINES:
- Mileage constructed annually since 1939, by crude oil, product, gas and all lines 195

PRODUCING WELLS:
- Gas wells end of each year since 1918 148
- Oil wells end of each year since 1918 167
- Oil wells, by states, by flowing and artificial lift methods, at end of 1947 and 1948 168

PRODUCTION:
- Crude oil, by states, by years, since 1859 and cumulative to end of 1948 144-146
- Crude oil, annually and daily, by states, for recent years 142
- Liquefied petroleum gas marketed, by uses, by years, since 1922 154
- Major refined products in 1948, 1947 and 1941 171
- Natural gas marketed, by states, by years, since 1906 151
- Natural gasoline, by states, by years 153

REFINING OPERATIONS:
- Capacity, by districts, end of 1948, 1947 and 1941 171
- Crude runs to stills, by years, since 1918 170
- Crude runs by districts, annually and daily in 1948, 1947 and 1941 171

STOCKS:
- All oils, crude oil, principal products 66-68

WILDCAT DRILLING:
- Completions, by states, in 1948 78-79
- New oil, gas and distillate fields, pays and extensions discovered, by states, in 1948 78-79

AMERICAN ROLLER BEARING CO.

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American Roller Bearings are specialized heavy-duty bearings ideally suited for oil-industry service. They are built specifically to withstand the most severe loads in deep drilling, and when properly selected, will outlast the equipment in which they are installed.

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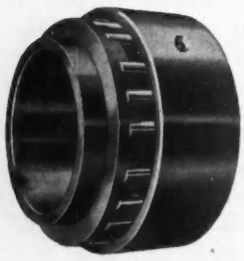
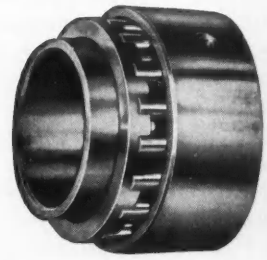
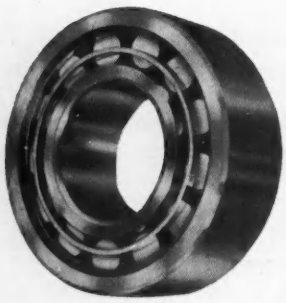


American conventional type roller bearings are all characterized by the same simplicity of design, special high quality bearing steel and precision manufacturing. They are made, however, in medium-heavy, heavy, and super-heavy duty types differing in cross section and weight to make each type exactly suitable for the loads and stresses imposed. Thus, there is an American straight roller type bearing for every condition and application required. American Roller Bearings are now used by more than 30 manufacturers of heavy duty drilling equipment. Available in steel end ring or bronze as desired.



AMERICAN ROLLER BEARINGS STAMPED CAGE TYPE



To meet the demands of many manufacturers for a precision bearing of moderate cost, American developed their stamped cage type. This is a straight inner race bearing with a stamped steel cage and snap rings retaining the roller assembly in relation to the outer race. Available in standard sizes or in special sizes to your order.

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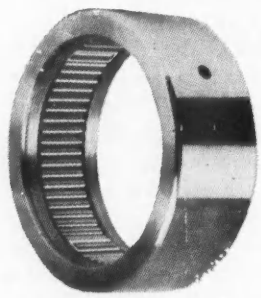
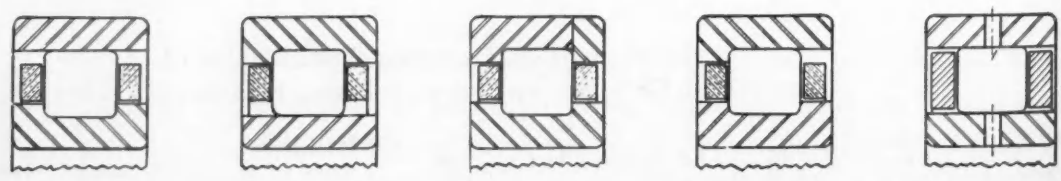


American Needle Bearings are manufactured in single row and double row styles to AFBMA standards. In addition, American Needle Bearings incorporate the patented Non-Skew feature consisting of 3 roller guide blocks spaced at 120° intervals to prevent roller twist or misalignment. Also furnished to special dimensions and with special clearances if required.

AMERICAN RADIAL ROLLER BEARINGS



Grooved inner race—straight outer race.

Grooved outer race—straight inner race.

Grooved inner race—one lipped outer race with plate forming second lip.

Grooved inner and one lipped outer race.

Straight inner and outer races.

American Radial Roller Bearings are engineered to exacting standards that result in better performance and minimum maintenance. Made with bronze cages. Furnished in 5 styles, 6 S.A.E. series. Special designs also available.

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In addition to the standard types and sizes, American Roller Bearings are custom made to your specifications and engineered to meet special requirements when necessary. Our engineering department and plant facilities are always available for this purpose. Let us be your bearing "specialists."

CENTRAL AMERICA

OIL activity in Central America during 1948 remained centered in Guatemala, Nicaragua and Panama. In Guatemala the outstanding event was the announcement of the new oil law, which is considered by most interested operators as too restrictive to be attractive. Nevertheless, Ohio Oil Company and The Atlantic Refining Company have each carried on geological and some instrument work, and Sohio Corporation is reported attempting to deal with the Government for a concession with drilling rights.

In Nicaragua American International Fuel and Petroleum Company (Gulf and Atlantic) abandoned its Twara 1 wildcat in March at 6297 feet, its second dry hole in two years. Its seismograph crews were moved out the latter part of the year. Twara 1 was about 16 miles northeast of Puerto Cabezas.

Sinclair Panama Oil Company drilled an 8000-foot dry hole on Colón Island in the Bocas del Toro region and is preparing to drill a wildcat near Puerto Armuelles on the Pacific side of the Isthmus. It is still doing geological work.

BAHAMA ISLANDS

FOLLOWING expenditure of an estimated $5 million by a group of British and American companies on some 30½ million acres of concessions in the Bahamas, it is reported that results have not been too encouraging, although there is some likelihood that a joint deep wildcat venture may be undertaken. All of the operators except the Shell Group have applied for renewal of licenses for 1949, and several of the companies continued survey work during the year. Anglo-Bahamian Pet. Co., Ltd. (Anglo-Iranian), Standard Oil Co. (Bahamas), Bahamas Oil Exploration Co. (Gulf) and British Bahamian Oil Dev. Co., Ltd., all carried on some gravitymeter and seismic work during the year.

CUBA

A SMALL amount of development drilling in the Jarahueco and Motembo fields has failed to halt the steady decline in Cuba's production. There has been no wildcat drilling since abandonment of the Shell Group's 10,563-foot test in August of 1947. Production of 112,000 barrels for the year from Jarahueco, Motembo and Bacuranao fields compares with total production of 280,000 barrels in 1947 and brought cumulative production to 715,000 barrels.

Cuba has three refineries with total capacity of 4,900 barrels, largest of which is Standard Oil Company of Cuba's 4,200-barrel plant at Belot, near Havana.

DOMINICAN REPUBLIC and HAITI

THE Dominician Republic and Haiti, were inactive during 1948. The most recent drilling operations in the Dominican Republic were the series of 13 tests drilled by Dominican Seaboard Oil Company between 1939 and 1947, the company's Maleno 7 being abandoned in June, 1947 at 5682 feet. The first in the series showed some oil, producing a total of 12,966 barrels of heavy crude, but no other wells have been productive.

The Atlantic Refining Company completed a series of 4 dry wildcats in Haiti in 1947 and surrendered its concessions.

TRINIDAD

TRINIDAD operators were still hampered somewhat during 1948 by a shortage of drilling materials, chiefly because of dollar shortage which made it necessary to concentrate more on drilling within proved areas rather than on a large-scale exploration program. Production of crude oil declined slightly to a total of 20,202,153 barrels during 1948 compared with 20,579,896 barrels in 1947.

A decline was also apparent in the total volume of drilling,

Oil Production and Producing Wells in Trinidad

FIELD	Operating Company	Year of Discovery	PRODUCING OIL WELLS END OF 1948			CRUDE OIL PRODUCTION (Barrels)			
			Flowing	Art. Lift	Total Producing	Daily at End 1948	Year 1947	Year 1948	Cumulative Through 1948
Barrackpore	Trinidad Leaseholds Ltd. (T.L.L.)	1918	11	32	43	1,452	443,118	568,443	6,963,010
Brighton	Antilles Petroleum Co. (Trinidad) Ltd.	1910	34	48	82	2,062	602,341	587,694	6,853,620
Coora	Trinidad Petroleum Development Co., Ltd.	1936	43	68	111	3,220	1,271,172	1,162,775	15,249,690
Cruse	Trinidad Central Oilfields Ltd.	1913	28	67	95	2,266	803,822	768,132	14,941,222
Erin & Mandingo	Trinidad Pet. Dev.	1948	1	1	2	....	.....	9,878	9,878
Forest Reserve	T. L. L.	1914	138	254	392	14,455	5,552,427	5,050,174	90,834,777
Fyzabad	Apex (Trinidad) Oilfields Ltd.; National Mining Corp. Ltd.	1920	56	330	386	6,500	2,680,194	2,476,623	83,260,033
Guapo	Kern Trinidad Oilfields Ltd.	1912	24	107	131	1,240	444,143	453,780	13,801,848
Guayaguayare	T. L. L.	1902	22	52	74	990	440,262	398,457	8,582,583
Los Bajos	Trin. Pet. Dev., United British Oilfields of Trinidad, Ltd.	1937	4	22	26	271	159,366	125,405	2,954,239
Morne Diablo	Siparia Trinidad Oilfields Ltd.	1936	3	20	23	366	120,210	98,727	2,222,370
New Dome	U. B. O.	....	....	10	10	....	.....	27,000	2,268,700
Palo Seco	Nat. Mining; Siparia Trin. Oilfields; Trin. Pet. Dev.	1926	29	193	222	1,776	579,315	571,980	22,698,586
Penal	U. B. O. T.	1935	35	37	72	6,620	2,081,700	2,375,600	13,195,000
Point Fortin		1908	175	108	283	8,290	2,901,300	2,926,300	56,760,200
Quarry	Apex; Trin. Pet. Dev.	1938	47	54	101	3,686	1,683,395	1,594,893	14,583,690
Quinam	T. L. L.	1936	2	10	12	354	75,088	82,843	1,191,306
San Francique	Nat. Mining: U. B. O.-T.	1922	2	41	43	520	225,113	189,107	5,547,099
Siparia Syncline	Apex	1945	5	....	5	700	179,600	331,400	531,700
Wilson	Trinidad Central	1918	10	25	35	1,153	337,330	402,942	3,128,426
Abandoned Fields		....	....	....	....	.....	.....	.....	4,853,537
Total		.....	669	1,479	2,148	55,921	20,579,896	20,202,153	370,431,514

TRINIDAD—Continued

the 134 wells completed in 1948 compare with 142 wells in 1947, and total footage dropped from 644,687 feet in 1947 to 553,882 feet in 1948. The year did see a definite trend toward drilling the deeper Tertiary formations, and these deeper horizons furnished the oil which served in some measure to offset the rather rapid decline from most of the older fields. All of the production in Trinidad still comes from Tertiary with the greater portion being produced from the Miocene, mostly from the Forest and Cruse sands. More recently a substantial volume of oil is coming from the Herrera sand in the Oligocene which has been found in several producing areas. Within the past two years an attempt has been made in a few wells to prospect the Cretaceous, but to date only one well on the Island has reached that formation. A well drilled during the past year near Brighton by Antilles Petroleum Company, Ltd. reached top of the Upper Cretaceous at 5555 feet, but after being carried to total depth of 7504 feet was abandoned with no important showings. In 1947 United British Oilfields of Trinidad drilled a test in the Cruse area to 11,042 feet, but found some of the lower Tertiary formations as much as 2000 feet deeper than expected and failed to reach the Cretaceous.

There is still some geophysical work being carried on in the Gulf of Paria in anticipation of granting of licenses for offshore operations, but approval is being held up until the Government and operators can agree on details.

The most important development of the past year has been expansion of the Penal and Wilson areas where the expansion of both fields to the south and west has been made possible by opening the new flank production. In the Penal field most of this new production is from the Herrara sand in the Oligocene, and has made possible an increase of nearly 300,000 barrels in output during 1948.

Discouraging to Trinidad operators is the trend toward increased taxation, with the added fear that there may be an increase in royalty rates during 1949.

Pipe Lines of Trinidad

COMPANY	Origin	Terminus	Length (Miles)	Diameter (Inches)	Year Completed
Crude Oil Lines:					
Trinidad Leaseholds Ltd.	Forest Reserve	Pointe-à-Pierre	16.3	10	1928
	Forest Reserve	Pointe-à-Pierre	16.3	8	1938
	Guayaguayare	Phillippine	27.5	6	1922
	Palo Seco	Forest Reserve	4.4	4	1934
	Morne Diablo	San Francique	5.7	4	1936
	Cruse	Forest Reserve	5.5	6	1944
United British Oilfields of Trinidad Ltd.	Penal	Point Fortin	18	8	....
	Quarry	Point Fortin	7.5	6	....
	Los Bajos	Point Fortin	8	6	....
	Los Bajos	Point Fortin	8	4	....
	Morne Diablo	Los Bajos	5	(2) 4	....
	Brighton and Guapo	Quarry	23	6	....
Natural Gas Lines:					
Trinidad Leaseholds Ltd.	Forest Reserve	Pointe-à-Pierre	16	12	1948
Refined Products Lines:					
Apex (Trinidad) Oilfields Ltd.	Fyzabad	Point Fortin	12	2	1930

Drilling in Trinidad

FIELD	WELLS COMPLETED IN 1948					FIELD WELLS DRILLING & S.D. AT END OF 1948		
	Oil	Gas	Dry	Total Wells	Total Footage	Drlg.	S.D.	Total
Barrackpore	5	..	..	5	27,813	1	....	1
Brighton	11	..	..	11	*	....	....	....
Coora	8	..	..	8	35,333	1	..	1
Cruse	3	..	..	3	11,112	..	..	..
Erin	2	..	..	2	9,727	1	..	1
Forest Reserve	23	..	2	25	97,034	5	..	5
Fyzabad	10	..	..	10	50,915	1	..	1
Guayaguayare	2	..	..	2	2,595	1	..	1
Palo Seco	1	..	..	1	9,559	1	..	1
Penal	17	..	1	18	74,878	3	1	4
Point Fortin	26	..	1	27	112,529	3	2	5
Quarry	14	..	1	15	78,238	2	..	2
Siparia Syncline	2	..	..	2	18,181	1	..	1
Wilson	3	..	..	3	8,140	1	..	1
Wildcats	1	..	1	2	17,768	1	..	1
Total	128	..	6	134	553,822	22	3	25

* Not available.

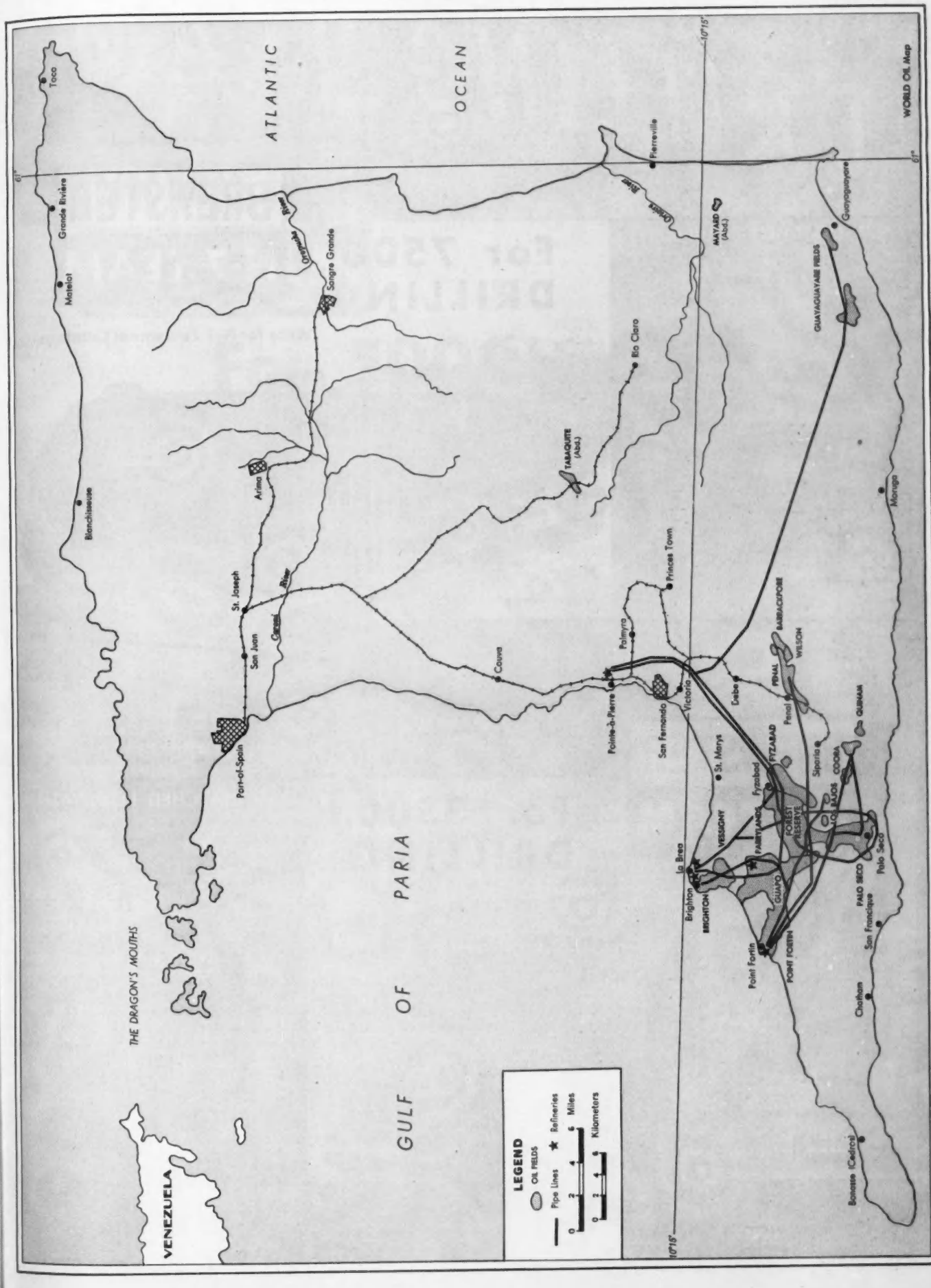
Refineries of Trinidad

COMPANY	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Type of Refinery	Operating Status
General Asphalt Co.	La Brea	1,000	None	Asphalt	Operating part time
Kern Trinidad Oilfields Ltd.	Guapo field	1,000	None	Skimming	Operating part time
Trinidad Leaseholds Ltd.	Pointe-á-Pierre	65,000	50,000	Complete	Operating
Trinidad Pet. Dev. Ltd.	Brighton	1,300	None	Skimming	Operating part time
United British Oilfields of Trinidad Ltd	Point Fortin	30,000	None	Complete	Operating

Engineering and Geological Data on Trinidad Fields

FIELD	Proved Area	Gravity of Oil	PRODUCING FORMATION			Depth of Wells (Feet)		Type Structure
			Name	Kind	Age	Min. to Top of Pay	Max. to Bottom of Pay	
Barrackpore	400	17.3-30.6	Wilson	Sand	Miocene	500	3,500	Faulted Anticline
			Herrera	Sand	Oligocene	3,000	6,000	
Brighton	500	18	Forest	Sand	Miocene	700	3,000	Anticline
Coora	1,000	15-49	Forest, Cruse, Morne L'Enfer	Sand	Miocene	500	6,500	Faulted Monocline
Cruse	250	13.2-30.5	Cruse	Sand	Miocene	1,800	4,000	Stratigraphic Trap
Erin	200	.....	Cruse	Sand	Miocene	3,000	3,850	Syncline
Forest Reserve	3,000	14.8-33.2	Forest	Sand	Miocene	....	3,500	Anticline
			Cruse	Sand	Miocene	1,500	8,000	Anticline
Fyzabad	2,000	16-34	Forest, Cruse	Sand	Miocene	127	7,200	Anticline
Guapo	3,400	14-24	Forest, Cruse	Sand	Miocene	250	5,000	Faulted Anticline
Guayaguayare	110	15.3-49.9	Forest, Cruse	Sand	Miocene	....	5,000	Fault Trap
Los Bajos	400	27.5	Forest, Cruse, Morne L'Enfer	Sand	Miocene	3,000	6,000	Faulted Monocline
Morne Diablo	50	20-33.2	Cruse	Sand	Miocene	1,000	4,700	Fault Trap
Palo Seco	500	17.8-33	Forest, Cruse	Sand	Miocene	800	6,000	Syncline
Penal	800	21.4	Wilson	Sand	Miocene	1,300	2,500	Faulted Anticline
			Herrera	Sand	Oligocene	1,600	8,900	Faulted Anticline
Point Fortin	1,300	17.4-26	Forest, Cruse	Sand	Miocene	1,000	7,500	Overthrust on Fault
Quarry	400	15-49	Forest, Cruse, Morne L'Enfer	Sand	Miocene	1,800	6,300	Faulted Monocline
Quinam	40	25.9-34.1	Cruse	Sand	Miocene	1,000	4,300	Fault Trap
San Francique	100	21.6	Forest, Cruse	Sand	Miocene	....	....	.....
Siparia Syncline	410	19-45	Cruse	Sand	Miocene	7,200	7,950	Fault Trap
Wilson	200	12.2-25.7	Wilson	Sand	Miocene	1,200	3,300	Faulted Anticline

TRINIDAD


ATLANTIC OCEAN
GULF OF PARIA
THE DRAGON'S MOUTHS
VENEZUELA
Toco
Grande Rivière
Matelot
Blanchisseuse
Arima
St. Joseph
San Juan
Caroni River
Port-of-Spain
Couva
Pointe-à-Pierre
San Fernando
Victoria
Princes Town
Poimyra
Sangre Grande
Oropuche River
Ortoire River
Pierreville
Rio Claro
TABAQUITE (Abd.)
MAYARO (Abd.)
Guayaguayare
GUAYAGUAYARE FIELDS
Morvant
Debe
Penal
FINAL
BARRACKPORE
WILSON
Siparia
QUINAM
COORA
LOS BAJOS
FORMOSA
FYZABAD
Fyzabad
St. Mary's
VESSIGNY
FAMILY LANDS
FOREST RESERVE
La Brea
Brighton
BRIGHTON
GUAPO
Point Fortin
POINT FORTIN
PALO SECO
Palo Seco
San Francique
Chaguaramas
Bonasse (Cedros)
LEGEND
OIL FIELDS
Pipe Lines
Refineries
Miles
Kilometers
WORLD OIL Map

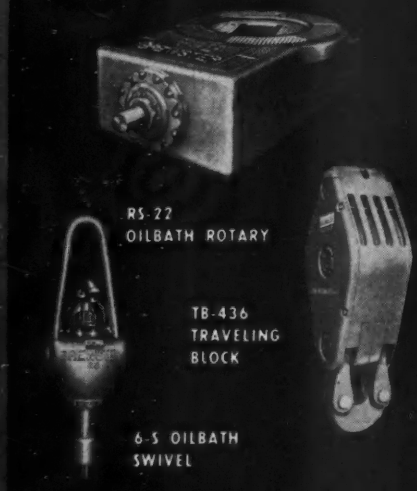
3 GREAT DRILLING TEAMS

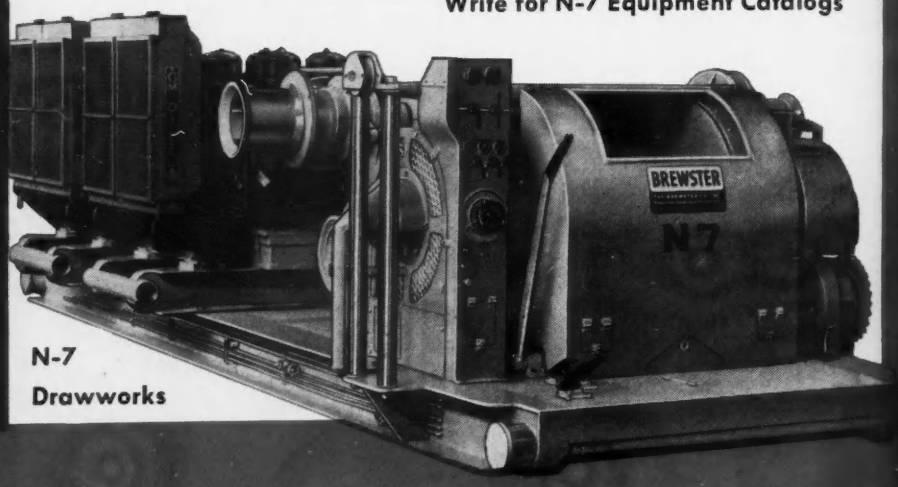
BREWSTER N-7 TEAM

For 7500' DRILLING

Write for N-7 Equipment Catalogs

N-7 MATCHED EQUIPMENT





N-7
Drawworks

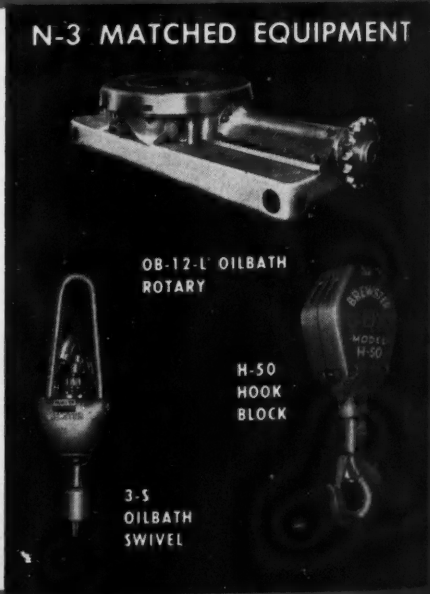
BREWSTER N-3 TEAM

For 3500' DRILLING

WRITE FOR N-3 EQUIPMENT CATALOGS

N-3
Drawworks

N-3 MATCHED EQUIPMENT



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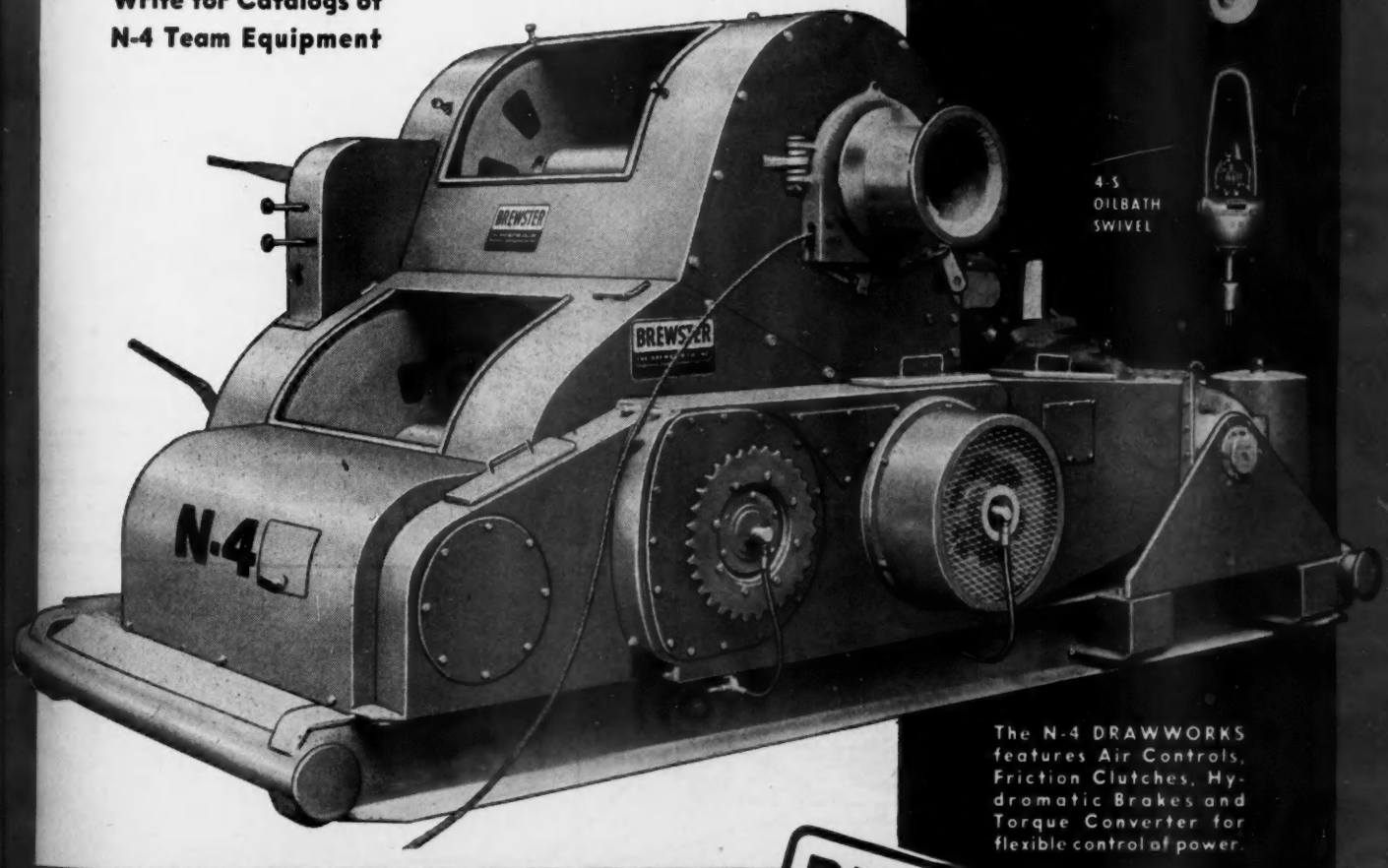

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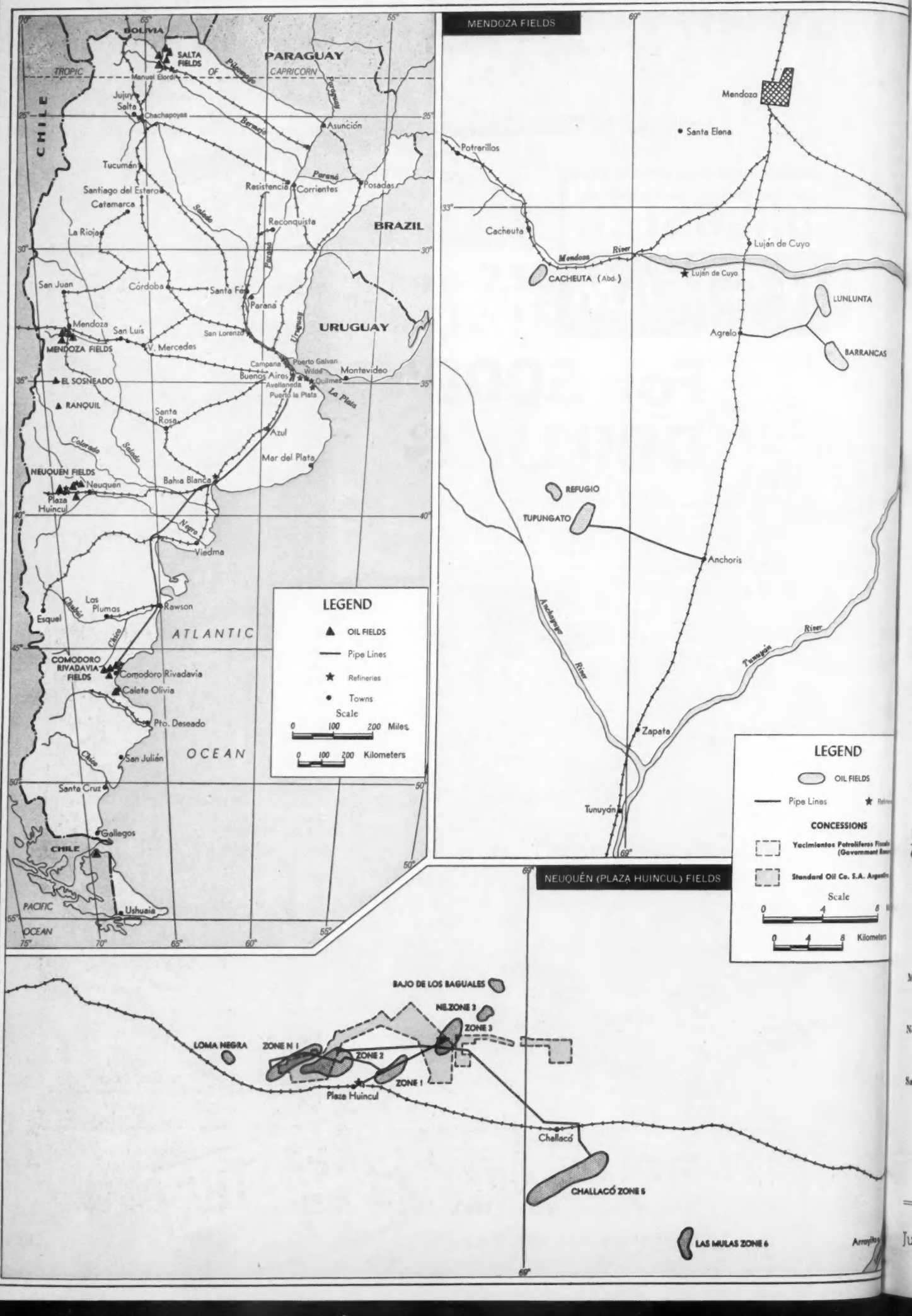
ARGENTINA—Mendoza and Neuquén (Plaza Huincul) Fields and Concessions



ARGENTINA

ARGENTINA has again succeeded in showing a slight increase in production over the previous year. The 1948 output of 22,991,892 barrels represents a boost of 5.2 percent over the 1947 production and is exceeded only by the years from 1942 to 1945. Argentina's peak output was in 1944 when production reached a total of 27,714,000 barrels, and if current producing rates can be maintained it is possible that figure may be approached during 1949. At the close of 1948 Argentina was producing at a daily rate of more than 71,000 barrels.

The increase in yield of crude oil cannot be attributed to the discovery of new producing areas, so much as to the ability of operators, particularly the Yacimientos Petroliferos Fiscales, the Government operating agency, to drill new wells without having to take some of the older wells off production.

The Compañía Astra de Petróleo, one of the private companies operating in the Comodoro Rivadavia area, found a deeper horizon in its Astra field and has done considerable development work on it during the past year. The net result was an increase in yield of nearly 400,000 barrels of lighter oil while drilling fewer wells than it drilled in 1947, and about the same footage. This field has been producing since 1914, and during the past year its output was 1,240,974 barrels from 255 wells.

During the year the Y.P.F. properties in the Comodoro Rivadavia area accounted for an increase of more than 468,000 barrels in production, and the fields in the Mendoza area showed an increase of nearly 281,000 barrels. Most of the other producing areas operated by Y.P.F. as well as those operated by private companies showed declines.

The position of Y.P.F. was materially strengthened during 1948 by the acquisition of producing properties previously owned by the Compañía Ferrocarrilera de Petróleo. These properties, all located in the Comodoro Rivadavia area, produced a little more than a million barrels of oil during 1947. The transfer was made in March of 1948. In addition to producing areas the properties also included a 6300-barrel refinery, shops, warehouses, housing developments, schools and other facilities.

The production figures given in the accompanying tables are correct insofar as the total production is concerned, but information on individual areas are not taken from the normal sources of statistical information where Y.P.F. is involved. The private companies have released exact information on all phases of their operations, but the Argentine Government decreed during the latter part of the year that information on its operations was to be considered a State secret. The figures on individual fields and areas have been taken from scattered data and publications of the official Government company and are quite accurate according to reliable informants. It was not possible to obtain accurate information on drilling operations by Y.P.F., but it is understood that there has been a satisfying increase in overall activity.

Argentina Crude Oil Production by Regions, YPF and Private Companies for Recent Years

YEAR	GOBERNACIÓN MILITAR COMODORO RIVADAVIA		NEUQUÉN		SALTA		MENDOZA		TOTAL		Grand Total
	YPF	Private[1]	YPF	Private[2]	YPF	Private[2]	YPF	Private[3]	YPF	Private	
Prior to 1944	137,499,041	100,289,709	10,724,155	10,975,559	6,514,912	16,636,947	12,604,982	319,236	167,343,090	128,221,451	295,564,541
1944	10,226,615	6,875,895	1,923,249	445,005	961,366	682,081	3,094,396	21,292	16,205,626	8,024,273	24,229,899
1945	9,722,422	6,411,096	1,964,141	382,061	665,281	618,949	3,102,020	14,999	15,453,864	7,427,105	22,880,969
1946	8,746,765	5,680,585	1,936,536	343,963	466,465	556,064	3,059,970	9,001	14,209,736	6,589,613	20,799,349
1947	9,913,417	5,789,590	2,024,800	296,048	471,414	494,382	2,847,133	8,816	15,256,764	6,588,836	21,845,600
1948	10,382,000	5,672,132	2,395,000	300,433	496,000	506,484	3,128,000	8,637	16,401,000	6,487,686	22,888,686
Cumulative to 12-31-48	186,490,260	130,719,007	20,967,881	12,743,069	9,575,438	19,494,907	27,836,501	381,981	244,870,080	163,338,964	408,209,044
Daily Average Production, 1948	28,366	15,498	6,544	821	1,355	1,384	8,546	23	44,811	17,726	62,537

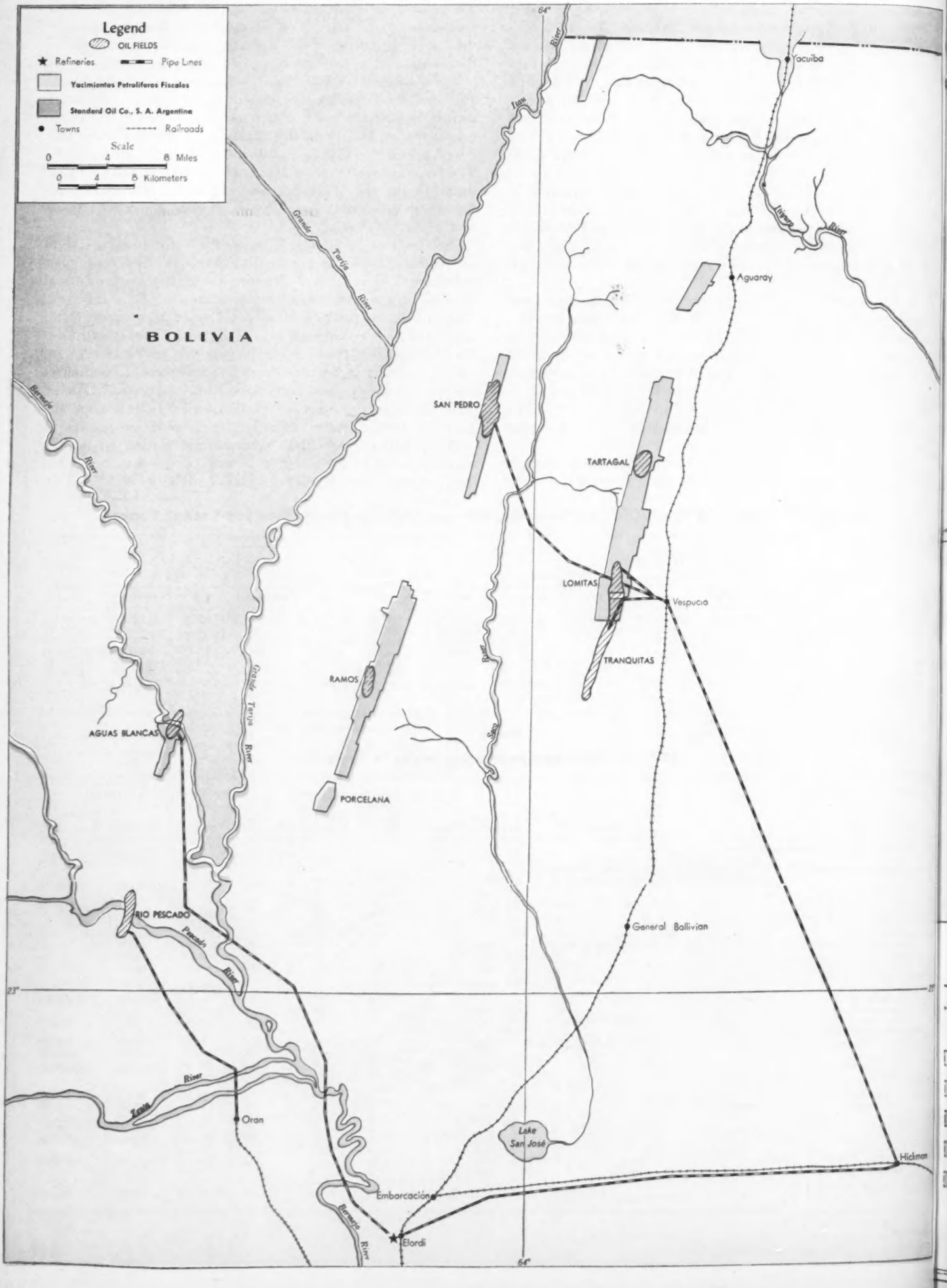
[1] Includes Diadema, Ferrocarriiera, and Astra. [2] Standard Oil. [3] El Sosneado.

Oil Production and Producing Wells in Argentina

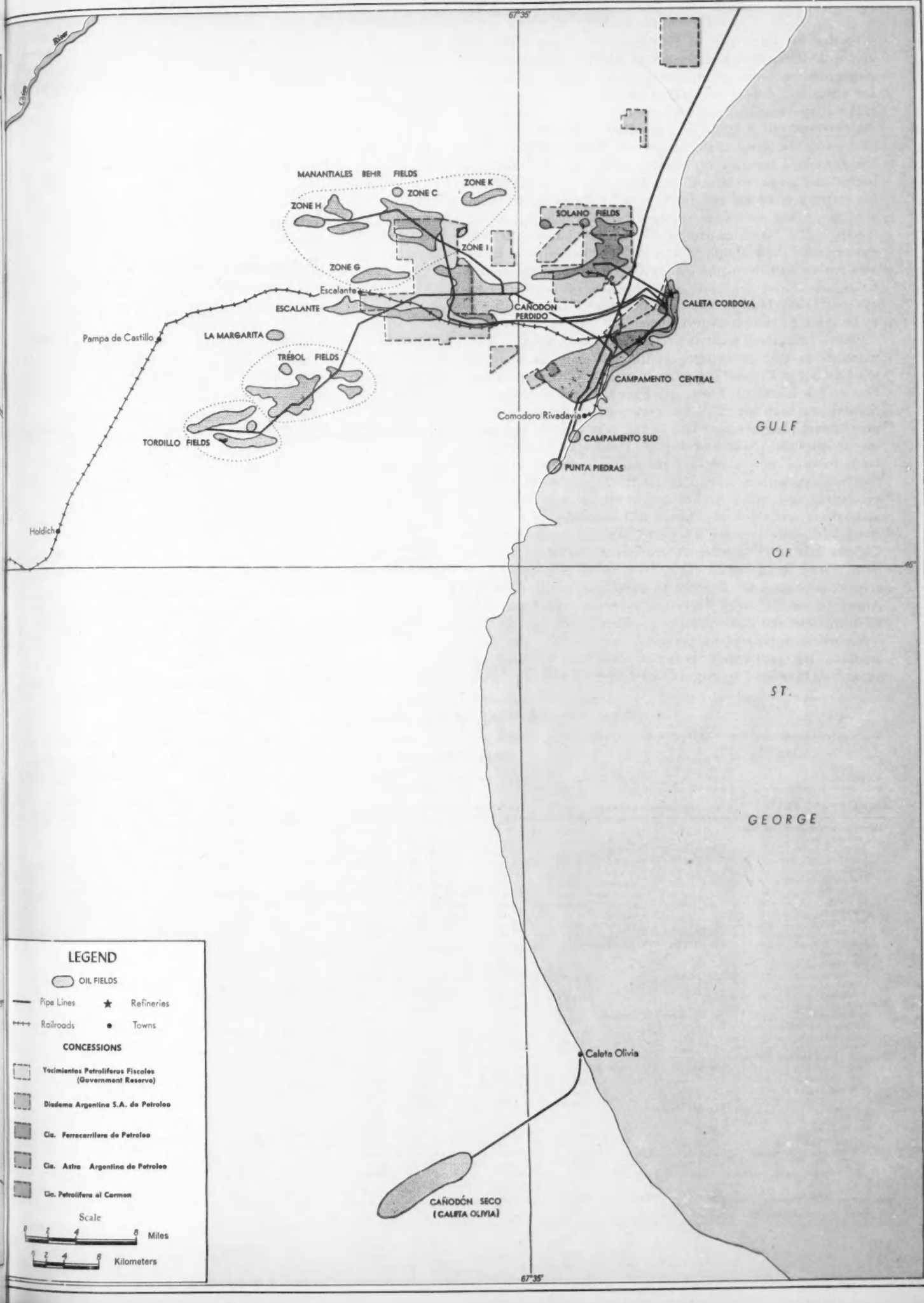
Province and Field	Company	Year of Discovery	Producing Oil Wells End of 1948			Crude Oil Production (Barrels)			
			Flowing	Art. Lift	Total Producing	Daily End 1948	Year 1947	Year 1948	Cumulative Through 1948
Gobernación Militar de Comodoro Rivadavia:									
Astra	Cía. Astra de Petróleo	1914	..	255	255	3,616	860,286	1,240,974	25,118,711
Comodoro Rivadavia	Yacimientos Petrolíferos Fiscales (Y.P.F.)	1904	7	1,373	1,380	28,366	9,154,407	10,382,000	186,490,260
Cañodón Seco		1945	10	3	13		759,010		
José Segundo	Cía. Ferrocarrilera e Petróleo	1922	..	18	18	94	38,159	34,562	674,060
Manantiales Rosales		1922	..	112	112	629	244,153	230,057	7,763,130
Kilometro 8		1915	..	270	270	913	413,956	334,102	25,631,954
Kilometro 27	Cía. Diadema de Petróleo	1924	..	401	401	10,017	3,926,238	3,688,379	67,324,513
Reserva	Cía. Ferrocarrilera de Petróleo	1922	..	2	2	12	4,937	4,429	136,462
Sindicato		1928	..	47	47	209	91,502	76,665	1,097,911
Solano		1924	..	103	103	590	210,359	154,451	3,102,854
Mendoza:									
Barrancas	Y. P. F.	1938	23	..	23	8,546	1,273,928	3,128,000	27,836,501
Lunlunta		1938	2	9	11		348,783		
Tupungata		1933	5	21	26		1,224,422		
El Sosneado	Cía. Rio Autel "El Sosneado"	1926	..	19	19	8,637	8,816	8,367*	381,981
Neuquén: (Plaza Huincul District)									
Plaza Huincul	Standard Oil Co. S.A., Argentina	1924	6	36	42	535	191,340	195,594	4,690,000
Dadín		1925	..	37	37	298	104,708	109,207	8,058,000
Plaza Huincul	Y. P. F.	1924	4	55	59	6,544	269,187	2,395,000	20,967,881
Challacó		1940	5	62	67		1,755,613		
Salta:									
Agua Blanca	Standard Oil Co.	1926	..	3	3	73	29,306	26,677	1,305,000
Cerro Tartagal		1927	..	3	3	30	11,868	10,977	105,000
Lomitas		1927	..	35	35	200	81,320	73,205	3,428,000
Ramos		1937	..	2	2	19	7,349	7,031	72,000
San Pedro		1928	1	21	22	1,082	364,539	395,945	14,592,000
Río Pescado	Y. P. F.	1933	4	19	23	1,355	165,388	496,000	9,575,433
Tranquitas		1928	2	69	71		299,717		
Vespucio		1928	..	3	3		6,309		
Total			69	2,978	3,047	71,765	21,845,600	22,991,892	408,351,651

* Estimated.

ARGENTINA—Salta Fields and Concessions



ARGENTINA—Comodoro Rivadavia Fields and Concessions



ARGENTINA—Continued

During the latter part of 1948 members of the first crews of the Drilling and Exploration Company were arriving in Argentina, and were awaiting only the arrival of equipment for operations before embarking on the first phases of the exploratory program for which the company contracted with the Government. A series of some 40 wildcat wells is scheduled under the terms of the agreement. Meanwhile the Y.P.F. has continued its own exploratory work, carrying out geological and geophysical work in a number of areas throughout the country from the far north to the extreme south. Some wildcat drilling was done in the regions which include the Neuquén and Mendoza groups of oil fields, but results were not reported. The Mendoza area is looked upon as a favorable region both from the standpoint of prospecting for new fields, and from the point of expansion of presently discovered fields. It is in this area that much drilling remains to be done to complete development of proved fields.

One of the areas most interesting to the Argentine technologists is that of extreme southern Patagonia, south of the Comodoro Rivadavia area and including the eastern portion of the island of Tierra del Fuego. A great deal of attention has been given to the region in the geological and geophysical program, and late in the year Y.P.F. was starting to provide roads and bridges, and was beginning to build housing and other accommodations for starting the first wildcat drilling operations on the island. After detailed geological and other preliminary work in the area it is understood that the first wildcats will be drilled on a general trend southeasterly from the Cerro Manantiales field on the Chilean side of the border. A prominent line of folding has been traced for a considerable distance on this trend, and several structures are thought to have been outlined on the Argentine side. Chilean operators have discovered one field on their side and have prospected several other structures.

According to the plans previously outlined by the Government, the exploration program should be continuously expanded. It is vital to Argentina's economy that it produce as much of its consumption as possible, but with increased industrialization the percentage has actually been progressively smaller, and the only hope for substantially improved production is discovery of additional new reserve. The only discovery of any magnitude in recent years has been the Cañodón Seco field near Caleta Olivia, about 80 miles south of Comodoro Rivadavia. Although still in the preliminary stages of development, it will be an important source of crude oil if it lives up to early estimates. It has already proved important in areal extent, and produces a much lighter oil than that yielded by the fields to the north.

Refineries of Argentina

COMPANY	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Type of Refinery	Operating Status
Cía. Nativa de Petróleos	Campana	16,000	8,000	Complete	Operating
	Puerto Galván	3,000	1,850	Skim-Crk.	Operating
Diadema Argentina S.A. de Petróleo (B.P.M.-Shell)	Dock Sud-Avellaneda (Buenos Aires)	12,000	8,000	Skim-Crk.	Operating
Condor S.A. Pet. Argentina	Avellaneda (Buenos Aires)	750	None	Skim-Lube	Moving & Revamping
Lottero-Papini y Cía.	Avellaneda (Buenos Aires)	630	None	Skim-Lube	Modernising
Cía. "La Isaura" S.A.	Bahia Blanca	2,200	None	Skim.	Shut Down
Standard Oil Co. S.A. Arg.	Manuel Elordi	1,000	None	Skim.	Operating
	Plaza Huincul	315	None	Skim.	Operating
Ultramar S.A. Petróleo Argentina	Avellaneda (Buenos Aires)	5,400	2,850	Complete	Operating
Cía. General Asfaltos	Wilde (Buenos Aires)	500	None	Skim-Lube	Operating
"Astra" Cía. de Petróleo, SA.	Comodoro Rivadavia	2,500	None	Skim.	Shut Down
Cía Ferrocarrilera de Pet. S.A. Com. e'Indust. "Ragor"	Comodoro Rivadavia	6,300	2,000	Skim-Crk.	Operating
	Quilmes (Buenos Aires)	300	None	Skim-Lube	Operating
Yacimientos Petrolíferos Fiscales (YPF)	La Plata	48,000	24,200	Complete	Operating, Enlarging
	San Lorenzo	10,700	None	Comb. Unit	Operating
	Luján de Cuyo	3,465	1,000	Comb. Unit	Operating
	Chachapoyas	1,900	None	Comb. Unit	Operating
	Plaza Huincul	1,260	504	Skim.-Crk.	Operating
	Buenos Aires	28,000	.....	Comb. Unit & Asphalt	Under Const.
	Motanza				

Drilling in Argentina

PROVINCE AND FIELD	Operating Company	WELLS COMPLETED IN 1947					WELLS COMPLETED IN 1948					FIELD WELLS DRILLING, S.D. & RIGGING END OF 1948			
					Total					Total					
		Oil	Gas	Dry	Wells	Footage	Oil	Gas	Dry	Wells	Footage	Drlg.	S.D.	Rig-ging	Total
Gobernación Militar de Comodoro Rivadavia:															
Astra	Compañia Astra de Petróleo	18	1	2	21	70,391	12	..	3	15	71,759	2	1	2	5
Cañodón Seco	Yacimientos Petroliferos Fiscales (Y.P.F.)	5	..	..	5	27,329	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Costa															
Campamento Sud															
Col. Sarmiento		66	2	3	71	279,389	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
El Trébol															
Escalante															
José Segundo		1	..	1	2	4,799	..	..	..	..	.....	..	..	..	..
Kilometro 27	Cía. Diadema de Petróleo	29	..	2	31	104,859	26	..	2	28	107,352	2	4	2	8
Kilometro 8	Cía. Ferrocarrilera de Petróleo	..	..	1	1	.....	2	1	..	3	4,904	..	..	..	..
M. Rosales		20	..	1	21	82,917	6	..	..	6	10,729	..	..	..	..
Salamanca		..	..	..	..	.....	..	1	..	1	1,264	..	..	..	..
Sindicato		6	..	..	6	19,063	..	..	..	..	.....	..	..	..	..
Solano		..	..	..	..	.....	11	1	2	14	29,180	..	..	1	1
Wildcats		4	..	1	5	24,082	..	..	..	..	.....	..	..	..	..
Mendoza:															
El Sosneado	Cía. Ríc Autel "El Sosneado"	..	..	..	..	.....	..	..	4	4	2,287	..	..	..	..
Barrancas-Lunlunta	Y. P. F.	4	..	..	4	22,631	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Tupungato		..	..	1	1	6,010	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Wildcats		1	..	..	1	8,113	..	..	..	..	.....	..	..	..	..
Neuquén: (Plaza Huincul District)															
Plaza Huincul	Standard Oil Co. S.A. Argentina	1	..	..	1	2,934	..	1	..	1	3,018	..	..	..	..
Plaza Huincul	Y. P. F.	19	2	1	22	73,700	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Wildcats		..	..	5	5	21,702	..	..	..	..	.....	..	..	..	..
Salta:															
Lomitas	Standard Oil Co	1	..	..	1	2,185	..	..	..	..	.....	..	..	..	..
San Pedro		..	..	2	2	3,553	1	..	..	1	2,943	1	1	..	2
Río Pescado	Y. P. F.	1	..	..	1	4,593	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Tranquitas		6	..	..	6	13,109	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Wildcats		..	..	1	1	3,037	..	..	1	1	4,614	..	..	..	..
Total		182	5	21	208	774,396	58	4	12	74	238,050	5	6	5	16

Note: n.a.—Not available.

ARGENTINA—Continued

The 1100-mile gas transmission line from Comodoro Rivadavia to Buenos Aires is making good progress and is scheduled for completion before the end of this year. A considerable amount of development work has been done in the Escalante field of the Comodoro Rivadavia group, building up gas potential to supply the line which will transport 35 million cubic feet daily to help save domestic and industrial fuel in the Buenos Aires area. It will also deliver some gas to several shortage areas on the east coast on the way to Buenos Aires.

While Yacimientos Petroliferos Fiscales is making every effort to enlarge its producing capacity and improve its transportation systems, it is also devoting considerable thought and energy to building up its refining industry with a view to bringing capacity up to the point where it will not be necessary to import refined products. For some time to come it is destined to import a substantial part of its total needs, but the Government wants to keep imports down to crude oil only, all of which can be refined locally. Currently its big La Plata refinery, near Buenos Aires which is rated at 41,000 barrels daily, is being enlarged and modernized and capacity is expected to be 48,000 barrels a day by the end of the year.

Also in the Buenos Aires area it is starting preliminary construction work on a new refinery at Matanza, scheduled to treat 28,000 barrels of crude oil daily, turning out a full range of products including asphalts. There are now 18 refineries in Argentina, not including the new plant being built at Matanza. Ten of them are owned by private companies, the other 8 by the Government. This includes the Ferrocarrilera plant at Kilometer 8 in the Comodoro Rivadavia area. The Astra plant in that area, listed as shut down, has been partially dismantled.

Pipe Lines of Argentina

Area and Company	Origin	Terminus	Length (Miles)	Diameter (Inches)	Capacity of Line (Bbls. Daily)
CRUDE LINES					
Gobernación Militar Comodoro Rivadavia					
YPF	El Tordillo	El Trébol	3.7	8	15,725
	El Trébol	Escalante	6.8	8	18,870
	Escalante	Cañadón Perdido	8.9	8–10	22,000
	Cañadón Perdido	Km. 9	5.8	7–8	
				9–10	28,300
	Cañodón Seco	Caleta Olivia	11	6	6,000
	Km. 9	Caleta Córdova	6	8	25,160
	Km. 9	Km. 5	3.5	9–10	25,160
	Km. 5	Km. 3	2.3	8–10	25,160
	Campamento Sur	Km. 3	2.7	5	6,290
	Manantiales Behr	C. Perdido	8.9	6–8	12,580
Astra	Field	C. Córdova	4.8	8	22,680
	Km. 23	Field	9.3	6	12,580
Diadema	Km. 27	Caleta Olivares	13.6	6	15,750
Ferrocarrilera	Manantiales Rosales	Km. 8	7.5	6	12,580
	Km. 8	C. Córdova	4.7	8	12,580
	Km. 8	Km. 3	3.7	6	12,580
	Mina Solano	Km. 8	18.6	6	12,580
Neuquén					
YPF	Field	Est. Challacó	3.9	4–6	9,400
Standard Oil Co.	Huincul	Dadín	7	3–6	2,000
	Dadín	Challacó	9	3–4	4,800
Mendoza					
YPF	Tupungato	Est. Anchoris	10.4	8	18,870
	Barrancas	Agrelo	9.3	3–4	3,100
Salta					
YPF	Río Pescado	Oran	16.8	4	3,775
	Tranquitas	Vespucio	3.7	3	1,885
Standard Oil Co.	Agua Blanca	Elordi	41.5	3	1,195
	San Pedro	Lomitas	16.3	4	3,900
	Lomitas	Vespucio	3.8	4	5,150
	Vespucio	Hickman	46	4–5–6	5,000
	Hickman	Elordi	37	4	2,500
GAS LINES					
Dirección Generál Gas del Estado	Comodoro Rivadavia	Buenos Aires	1,100	10	35 mln[1]
	Luján de Cuyo	Mendoza	37.2	3–4	.....
	La Plata	Buenos Aires	37.2	6	.....

[1] Under Construction.

Engineering and Geological Data on Argentina Fields

PROVINCE AND FIELD	Est. Proved Area (Acres)	Gravity Oil (API)	PRODUCING FORMATION: Local Name	Kind	Geologic Age	Minimum to Top of Pay	Maximum to Bottom of Pay	Avge. Thickness of Pay (Ft.)	Type Structure
Gobernación Militar Comodoro Rivadavia:									
Astra	2,965	22.3	Glauconitico	Sand	Upper Cretaceous	1,740	3,280	50	Faulted Anticline
Campamento Sud	300	20	Glauconitico	Sand	Upper Cretaceous	1,917	2,300	26	Anticline
Cañodón Seco	4,000	30.6	.....	Sand	Jurassic	4,085	5,612	10	Faulted Anticline
Col. Sarmiento	20	23	Glauconitico	Sand	Upper Cretaceous	2,310	2,640	26	Faulted Anticline
Costa	13,840	20	Glauconitico	Sand	Upper Cretaceous	1,815	2,805	30	Faulted Anticline
El Trébol	14,500	23	Glauconitico	Sand	Upper Cretaceous	3,878	5,960	33	Faulted Anticline
Escalante	18,640	23.5	Glauconitico	Sand	Upper Cretaceous	2,260	4,290	33	Faulted Anticline
José Segundo	90	19	Lignitifero	Sand	Lower Cretaceous	2,300	3,970	30	Anticline
Kilometro 8	3,900	19	Glauconitico	Sand	Lower Cretaceous	1,675	1,965	50	Faulted Anticline
Kilometro 27	8,975	24	Glauconitico	Sand	Upper Cretaceous	3,088	3,372	26	Anticline
Manantiales Rosales	2,400	19	Glauconitico	Sand	Lower Cretaceous	1,975	3,900	26	Faulted Anticline
Reserva	75	19.5	Continental	Sand	Lower Cretaceous	1,750	1,985	15	Anticline
Sindicato	415	19	Glauconitico	Sand	Upper Cretaceous	2,965	3,030	15	Anticline
Solano	5,000	20.6	Galuconitico	Sand	Lower Cretaceous	1,540	2,920	35	Faulted Anticline
Mendoza:									
Cacheuta	700	31	Victor "C" & Potrerillos	Sand	Triassic	1,940	3,080	13	Monocline
Lunlunta (Barrancas)	1,446	28	Potrerillos Tillita	Sand	Triassic	7,720	7,890	45	Anticline
Sosneado	150	12.9	Victor	Sand	Triassic	544	551	..	Monocline
Tupungato	645	30	Victor	Sand	Triassic	5,870	6,310	69	Anticline
Neuquén (Plaza Huincul District):									
Bajo de los Baguales	300	38.5	Dogger	Sand	Jurassic	3,383	3,386	20	Monocline
Centro Octógono	150	32	Dogger	Sand	Jurassic	1,880	1,950	40	Monocline
Challacó	1,688	22.5	Dogger	Sand	Jurassic	3,300	3,425	66	Faulted Anticline
Dadín	325	33.1	Dogger	Sand	Jurassic	1,990	2,320	40	Stratigraphic trap
Laguna Colorada	750	33.5	Dogger	Sand	Jurassic	2,450	2,610	56	Monocline
Oeste Octógono	1,800	31.5	Dogger	Sand	Jurassic	2,300	2,365	33	Monocline
Plaza Huincul	2,157	29.9	Dogger	Sand	Jurassic	2,200	2,500	26	Anticline
Salta:									
Agua Blanca	49	21.6	Tarija	Sand	Permian	2,300	3,600	33	Anticline
Lomitas	576	44.5	Tarija	Lime	Permian	.....	2,185	..	Anticline
Ramos	30	51.5	Devonico	Sand	Devonian	2,900	3,930	30	Faulted Anticline
Río Pescado	62	49	Terciario	Sand	Tertiary	4,175	4,376	103	Anticline
San Pedro	504	45.5	Tarija Tupambi	Sand	Permian	1,800	3,300	60	Anticline
Tartagal	40	42.5	Escarpment Tarija Devonico	Limestone, Sand	Permian	.....	2,350	..	Anticline
Tranquitas	3,053	....	Gondwana	Lime	Permian	1,950	2,350	200	Faulted Anticline

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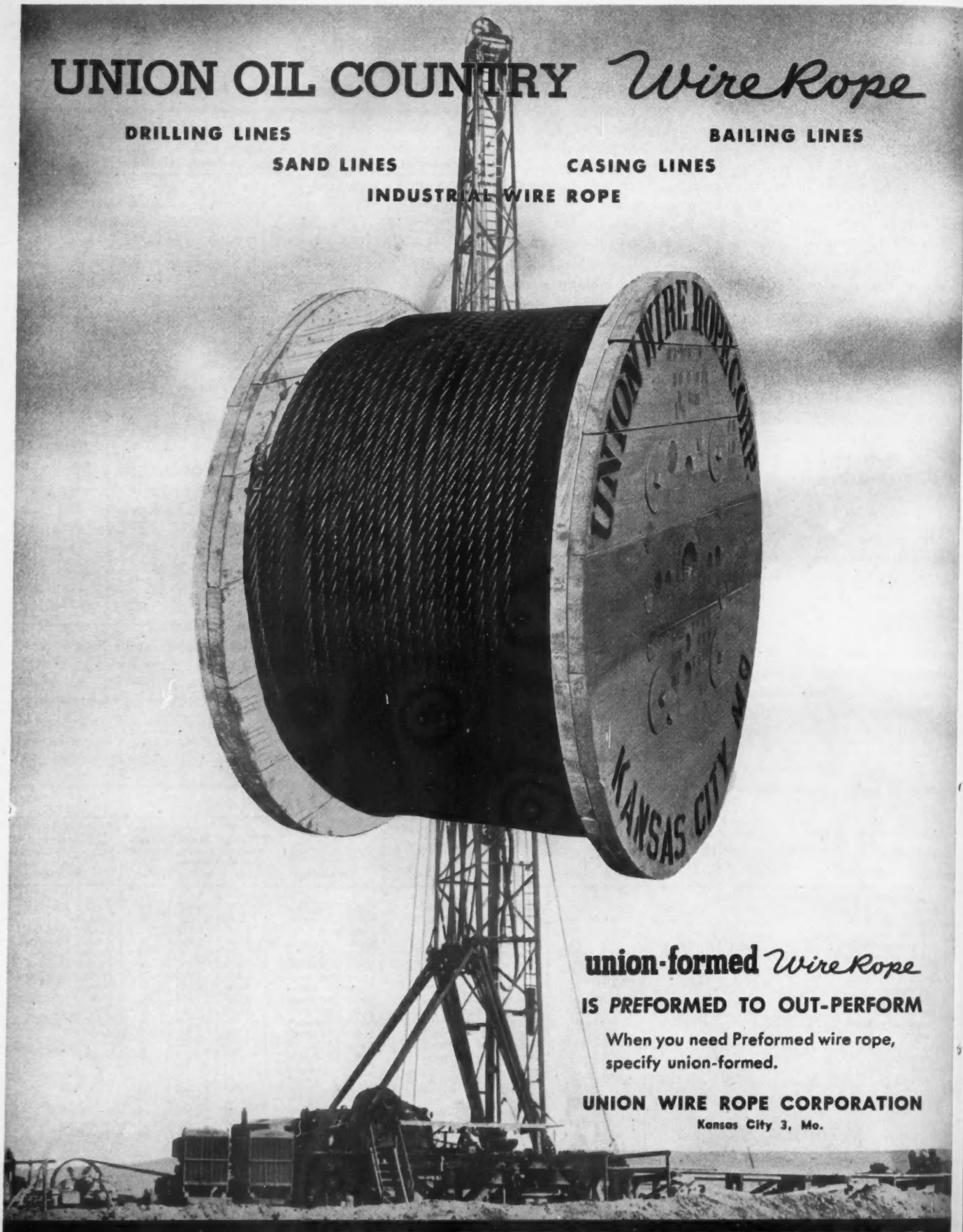

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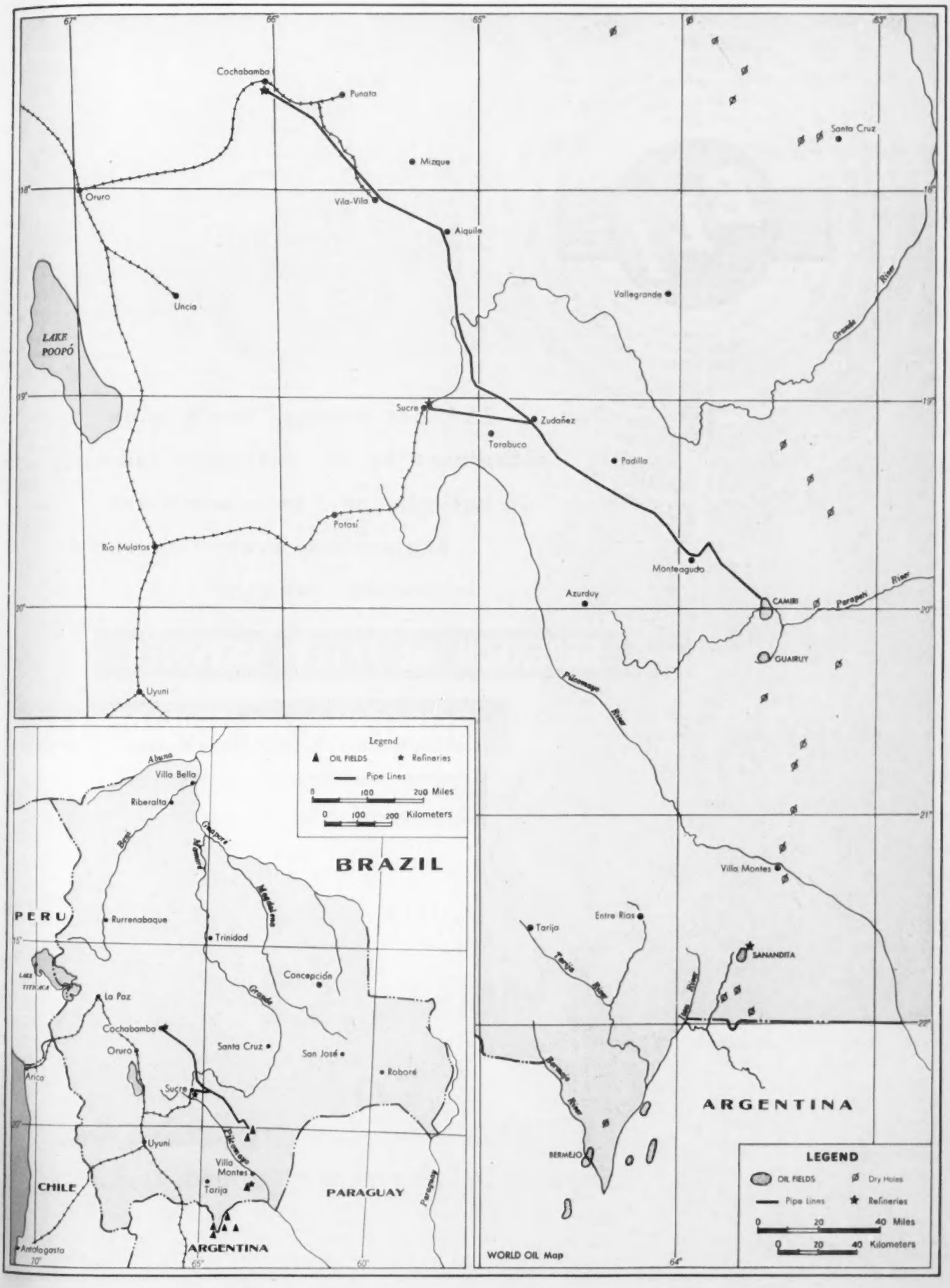
BOLIVIA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Tarabuco
Padilla
Potosí
Río Mulatos
Monteagudo
Azurduy
CAMIRI
Parapeti River
GUAIRUY
Uyuni
Pilcomayo River
Villa Montes
Entre Rios
Tarija
Tarija River
SANANDITA
Pilcomayo River
ARGENTINA
BERMEJO
WORLD OIL Map
Legend
OIL FIELDS
Refineries
Pipe Lines
0 100 200 Miles
0 100 200 Kilometers
BRAZIL
PERU
CHILE
PARAGUAY
ARGENTINA
Abuna
Villa Bella
Riberalta
Beni
Guaporé
Mamoré
Mojos Llanos
Rurrenabaque
Trinidad
LAKE TITICACA
La Paz
Concepción
Grande
Cochabamba
Oruro
Santa Cruz
San José
Roboré
Arica
Sucre
Uyuni
Villa Montes
Tarija
Pilcomayo
Paraguay
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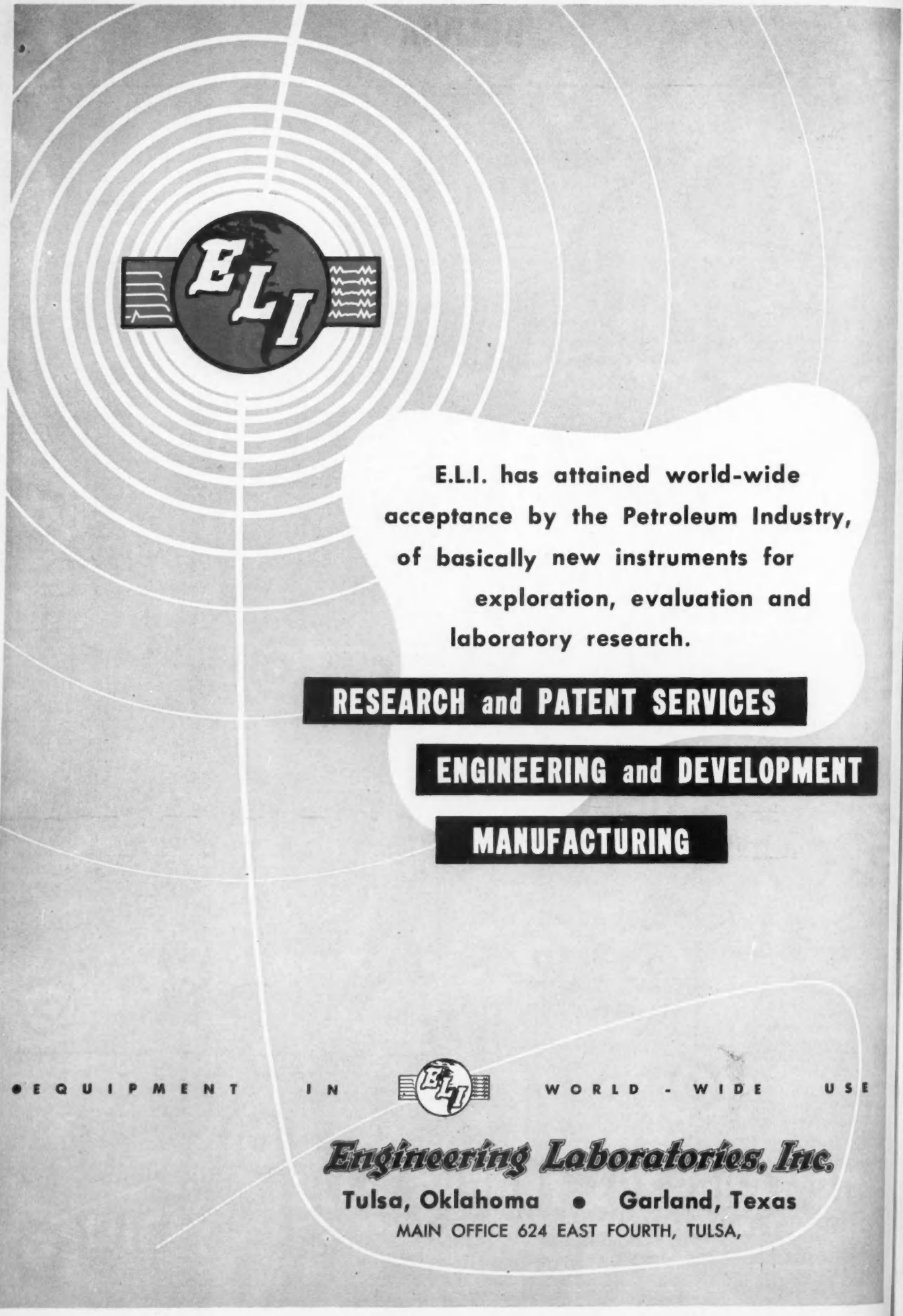
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BOLIVIA

BOLIVIA is making good progress on its three-point program to make itself independent of outside supplies of petroleum and products. It is placing current emphasis on the completion of the pipe line and two new refineries, and at the same time concentrating on the development of the Camiri field so that adequate supplies of crude will be available to fill the line and keep the new plants operating.

Total production from Bolivia's fields reached 463,500 barrels in 1948, an increase of nearly 23 percent over 1947, but it must be remembered that the figures do not reflect the producing potential of the country, since Camiri field production is limited by the capacity of a local refinery and to local consumer demand, and Camiri is the field which has the best potential of the three currently producing areas. The completion of four new oil wells at Camiri brings to 12 the number of producers, and it is thought that the field is now capable of producing something like 4000 barrels a day. Potential is expected to reach 5000 barrels a day by the time the new pipe line goes into operation.

Completion of this new line is expected during 1949, with increased deliveries of material, and the project should be ready to deliver crude oil by the time the refineries are ready. The line is to consist of 355 miles of 6-inch and 50 miles of 4-inch pipe, running from Camiri field to Cochabamba with a 4-inch spur line to Sucre.

The new refineries are under construction at Cochabamba and at Sucre and will have capacities of 5000 barrels and 3000 barrels respectively. From these two locations it will be possible to transport products by rail to all principal consuming centers in the uplands region. Existing refineries are small plants at Camiri and Sanandita with capacities of 1384 and 410 barrels respectively.

Wildcat drilling has established the presence of commercial oil on the Mandeyapecua prospect, in a well which is still drilling, and at Guayruy, just south of Camiri field. A rig is being kept busy in each of these areas.

Oil Production and Producing Wells in Bolivia

DEPARTMENT AND FIELD	Year of Discovery	Producing Oil Wells End of 1948			Crude Oil Production (Barrels)			
		Flowing	Art. Lift	Total Production	Daily at End of 1948	Year 1947	Year 1948	Cumulative Through 1948
Chaquisaca:								
Camatindi	1928	Inactive	....	.....	.....	.....	.....	11,876
Santa Cruz:								
Camiri	1927	11	1	12	730	164,509	267,438	1,834,090
Tarija:								
Bermejo	1927	1	5	6	294	112,050	107,301	860,074
Sanandita	1926	2	9	11	243	100,803	88,821	1,617,662
Total	.....	15	15	29	1,267	377,362	463,560	4,423,702

Drilling in Bolivia

DEPARTMENT AND FIELD	WELLS COMPLETED IN 1947					WELLS COMPLETED IN 1948					WELLS DRILLING AND SHUT DOWN AT END OF 1948		
	Oil	Gas	Dry	Total Wells	Total Footage	Oil	Gas	Dry	Total Wells	Total Footage	Drls.	S.D.	Total
Santa Cruz													
Camiri	3	..	..	3	9,137	4	..	1	5	13,796	4	4	8
Guayruy	1	..	..	1	1,731	..	..	..	..	.....	1	1	2
Mandeyapecua	..	..	..	..	.....	..	..	..	..	.....	1	1	2
Tarija													
Bermejo	1	..	..	1	2,319	..	..	1	1	1,187	2	1	3
Sanadita	1	..	..	1	2,657	..	..	..	..	.....	2	4	6
Total	6	..	..	6	15,844	4	..	2	6	14,983	10	11	21

Note: All fields operated by Yacimientos Petroliferos Fiscales Bolivianos.

Engineering and Geological Data on Bolivia Fields

DEPARTMENT AND FIELD	Est. Proven Area (Acres)	Gravity of Oil A.P.I.	Name	Kind	Age	DEPTH (Feet)		Average Thickness of Pay (Ft.)	Structure
						Minimum to Top of Pay	Maximum to Bottom of Pay		
Chuquisaca:									
Buena Vista*	1,475	43.5	.....	Sand	Devonian	....	3165	....	Elongated Dome
Caigua*	.....	.....	.....	.....	.....	....	....	....	Anticline
Camatindi*	1,120	41.5	.....	Sand	Devonian	2350	4300	....	Faulted Anticline
Santa Cruz:									
Camiri	640	53.1	Iquiri	Sand	Devonian	....	3200	100	Anticline
Guairuy	.....	57.8	Guairuy	Sand	Devonian	1731	....	....	Anticline
Saipuru*	740	40	.....	Sand	Devonian	500	....	....	Anticline
Tarija:									
Bermejo	600	25.7	Tarija	Sand	Permi-Triassic	2214	3600	....	Anticline
Sanandita	200	41.5	Totora	Sand	Permi-Triassic	200	2100	....	Anticline
Total	4,775								

*Inactive fields.

BRAZIL

BRAZIL's producing fields, all located in the Bahia, area, are still being produced at purely nominal rates, awaiting completion of a refinery which is now in the process of construction in the area. During 1948 total outlet from the fields was 143,403 barrels, a substantial increase from the 96,808 barrels produced the previous year, but still represents a comparatively small proportion of the actual producing potential, particularly as regards the Candeias and the Dom João fields.

Two wildcat wells were completed during the year, one of them, the Santo Antonio 1, being the deepest well ever drilled in Brazil at 9088 feet. This well, drilled by the Conselho Nacional do Petróleo, was a dry hole situated just over a mile east of Candeias. The other well, Tucano 1,

Oil Production and Producing Wells in Brazil

STATE AND FIELD	Year of Discovery	Producing Oil Wells End of 1948			Crude Oil Production (Barrels)			
		Flowing	Art. Lift	Total Production	Daily at End of 1948	Year 1947	Year 1948	Cumulative Through 1948
Bahia:								
Aratu	1942	..	3	3	8	2,741	2,986	54,580
Candeias	1941	13	33	46	430	84,721	126,601	344,084
Dom João	1947	..	2	2	20	2,073	8,342	10,415
Itaparica	1942	7	9	16	..	112	.....	52,421
Lobato-Joanes	1939	..	4	4	20	7,077	5,474	68,014
Pitanga	1945	..	..	..	..	84	.....	401
Total	.....	20	51	71	478	96,808	143,403	529,915

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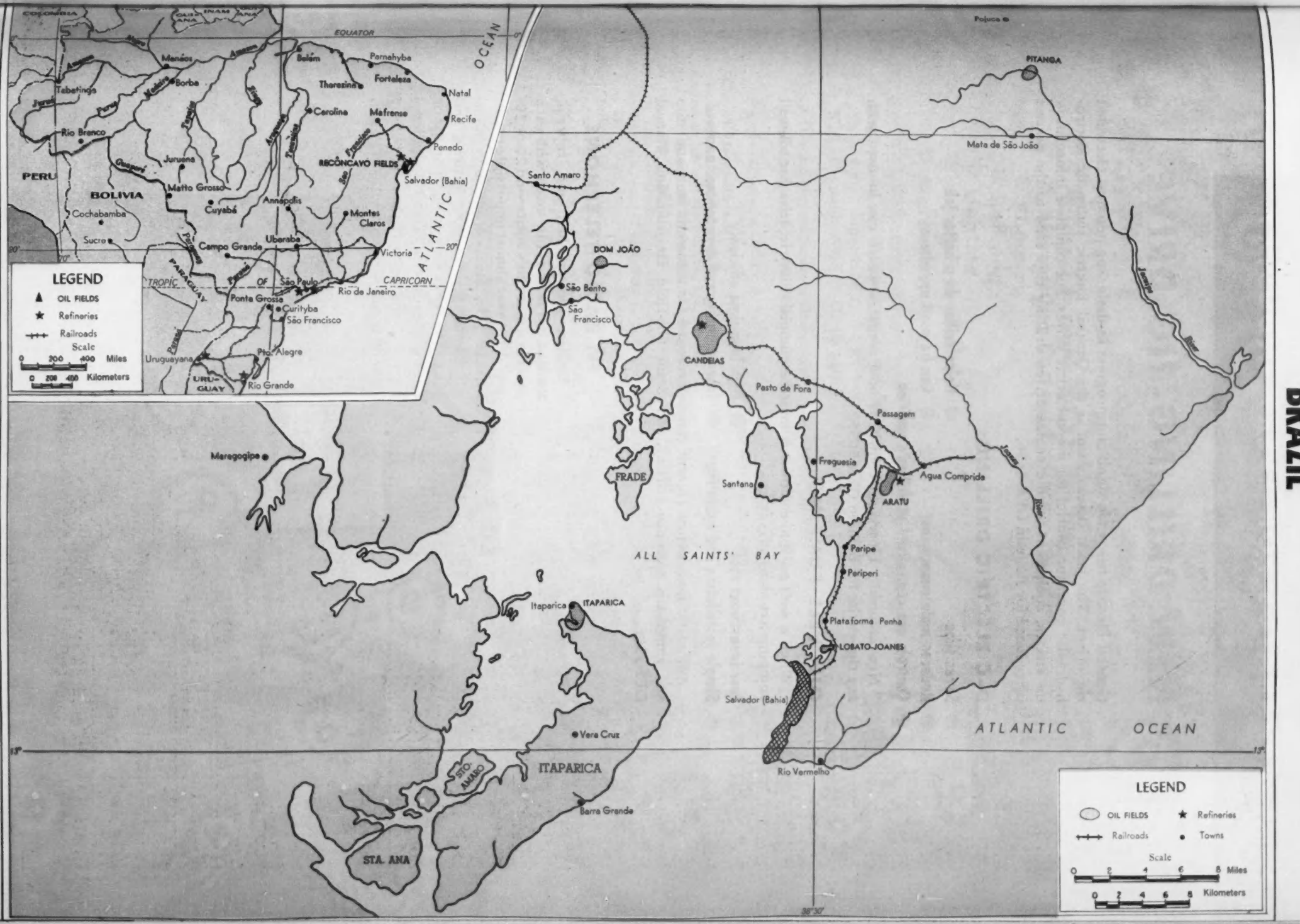
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Scale
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Pojuca
PITANGA
Mata de São João
Santo Amaro
DOM JOÃO
São Bento
São Francisco
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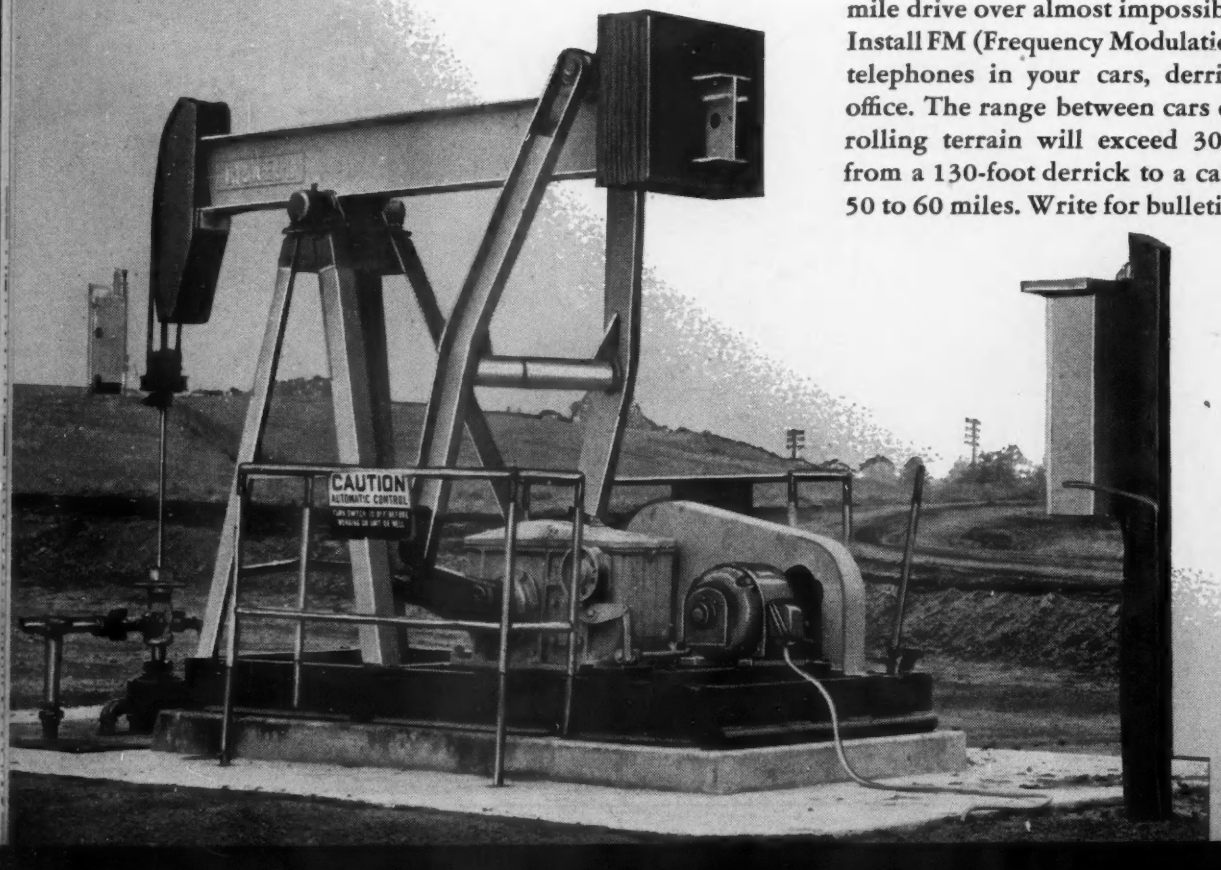

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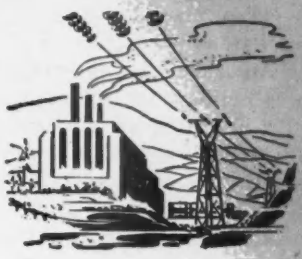

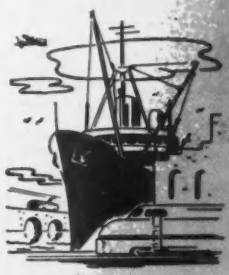

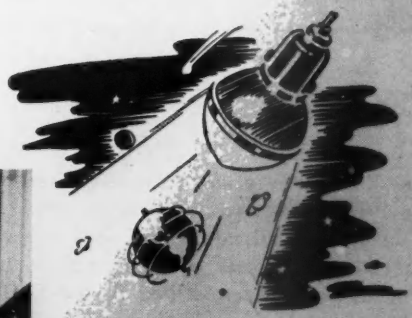

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BRAZIL—Continued

was drilled in North Bahia and was dry at a depth of 5758 feet. The program for 1949 includes drilling several wildcats in new areas, one of which will be on Marajó Island and the other in the interior of the State of Maranhão, both in Northern Brazil. At the same time geological studies are being carried out in all parts of Brazil with special attention to Bahia, Sergipe, Alagoas, Piaui Maranhão, Goias, Para and Parana, and geophysical work has now been pushed up the Amazon as far as Monte Alegre with a number of structures outlined for future drilling.

Brazil's program of expanding refining capacity is seen in new projects with combined throughput capacity of 77,500 barrels. One of these, a 2500-barrel plant is now being built at Mataripe, 20 miles from Salvador in the vicinity of Candeias Field. Another is planned for Government construction at Belem to have a capacity of 45,000 barrels a day.

Two others are to be built by private Brazilian capital. One, with capacity of 10,000 barrels is to be built near the city of Rio de Janeiro and the other, with planned capacity of 20,000 barrels daily is to be built near São Paulo. This latter plant is to be served by a new 28.7-mile pipe line from Santos.

The proposed new petroleum law is now in the Congress for discussion, but according to reports of its provisions, it seems unlikely that it will attract foreign operators.

Engineering and Geological Data on Brazil Fields

State and Field	Proved Area (Ac'es)	Gravity (API)	Name	Kind	Age	Depth (Feet) Minimum to Top of Pay	Depth (Feet) Maximum to Bot- of Pay	Avg. Thickness of Pay (Feet)	Type of Structure
Bahia:									
Aratu	74	42	Santo Amaro	Sand	Cretaceous	1,312	1,968	66	Anticline
Candeias	1038	26	Santo Amaro	Sand	Cretaceous	2,461	3,937	33	Lenses
Dom João	100	39	Santo Amaro Sergi	Sand	Cretaceous	886	1,313	131	Anticline
Itaparica	148	30	Santo Amaro Sergi	Sand	Cretaceous	1,968	2,461	33	Anticline
Lobato-Joanes	30	35	Santo Amaro	Sand	Cretaceous	1,312	1,706	82	Faults
Pitanga	....	26	Sto. Amaro	Sand	Cretaceous	4,865	.....	8	Anticline

Drilling in Brazil

State and Field	Wells Completed in 1947 Oil	Gas	Dry	Total Wells	Total Footage	Wells Completed in 1948 Oil	Gas	Dry	Total Wells	Total Footage	Wells Drlg. & Shut Down at End of 1948 Drlg.	S.D.	Tot.
Bahia:													
Aratu	..	..	..	..	.....	..	..	..	..	.....	..	..	..
Candeias	17	..	1	18	55,377	8	..	1	9	32,083	2	..	11
Dom João	4	..	1	5	5,968	6	..	..	6	6,355	1	..	6
Itaparica	..	1	..	1	5,100	..	..	..	..	.....	..	..	..
Lobato-Joanes	..	..	..	..	.....	..	..	..	..	.....	..	..	..
Pitanga	..	..	2	2	5,074	..	..	..	..	.....	..	..	..
Total	21	1	4	26	71,519	14	..	1	15	38,438	3	..	17

Refineries of Brazil

COMPANY	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Type of Refinery	Operating Status
Conselho Nacional do Petróleo	Bahia	2,500	.....	Cracking	Building
	Bahia	150	.....	Skimming	Operating
Distilaria Rio Grandense	Rio Grande do Sul	500	.....	.....	.....
Industria Matarazzo de Energia S.A.	São Paulo	1.000	.....	Skimming	Operating
Ipiranga S.A. Companhia Brasilera do Petróleos	Rio Grande do Sul	1,000	.....	Skimming	Operating
Refinaria e Exploração de Petróleo União S.A.	São Paulo	20,000	.....	Cracking	Planned
Refinaria do Petróleo Distrito Federal S.A.	Distrito Federal	10,000	.....	Cracking	Planned

CHILE

CHILE'S Cerro Manantiales field was further expanded during 1948 through completion of three oil and three gas wells, bringing total number of wells capable of production at the end of the year to eight, not including the six gas wells which have been drilled in the field. However, there is still no record of production, since the field remains shut in, waiting on completion of the new pipe line from the field to a marine terminal on the western side of Tierra del Fuego Island. As of the end of the year it is estimated that the wells now completed and shut in are capable of producing a minimum steady output of 2000 barrels a day. During January, 1949 two other wells which were standing cemented at the end of 1948 were completed, adding two other producers not included in the above total.

Drilling activity for the year also included two wildcats, one at Espora, 5 miles north of Cerro Manantiales, which was abandoned at 7050 feet after showing some oil and gas along with the salt water which appeared in the Manantiales formation, and another wildcat, San Sebastián 2, on a prospect 55 miles southeasterly from Manantiales, which was abandoned at 7510 feet. It had saturation in the Manantiales formation and actually produced some oil on tests, but the formation lacked permeability. With the 14,560 feet drilled in the two wildcats, total drilling in Chile during 1948 amounted to 59,560 feet. At the beginning of the year important outpost wells were being drilled south and west of production at Cerro Manantiales.

The pipe line will be a 42.5-mile system from the field of 8-inch line with 4-inch connections to wells and batteries. The terminal is Caleta Clarencia on Gente Grande Bay on the Straits of Magellan. It will have 215,000 barrels storage capacity and a 3300-foot 16-inch submarine loading line.

During 1949 another well will be drilled at Espora, and a new wildcat is scheduled for Cerro Sombrero, about 10 miles south of Cerro Manantiales field.

Data on Cerro Manantiales Field

Operating Company		Corporación de Fomento de la Producción
Year of Discovery		1945
Producing wells at end of 1948:	Oil	8
	Gas	6
Production during 1948		None (Shut in, waiting for pipe line)
Wells drilled during 1948	Oil	3
	Gas	3
	Dry	0
	Total	6
Footage drilled during 1948		45,000
Field wells drilling at end of 1948		2
Estimated proven area		400 acres
Gravity of oil (A.P.I.)		39-40 degrees
Producing Formation:		
Local name		Cerro Manantiales
Kind		Sand
Age		Cretaceous
Minimum depth to top of pay		7350 feet
Maximum depth to bottom of wells		7550 feet
Average thickness of pay		65 feet
Type of structure		Anticline

CHILE

OIL AND GAS FIELDS
Dry Holes
Structures
Pipe Lines
Miles
Kilometers
POINT ANEGADA
Espora
CAPE ESPORA
STRAITS OF MAGELLAN
TIERRA DEL FUEGO
CERRO MANANTIALES (SPRINGHILL)
OCEAN
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ARGENTINA
TIERRA DEL FUEGO
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Río Grande
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Lake Fagnano
NAVARINO
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PACIFIC
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OIL FIELDS
Dry Wildcats
Pipe Lines
Towns
30 Miles
30 Kilometers

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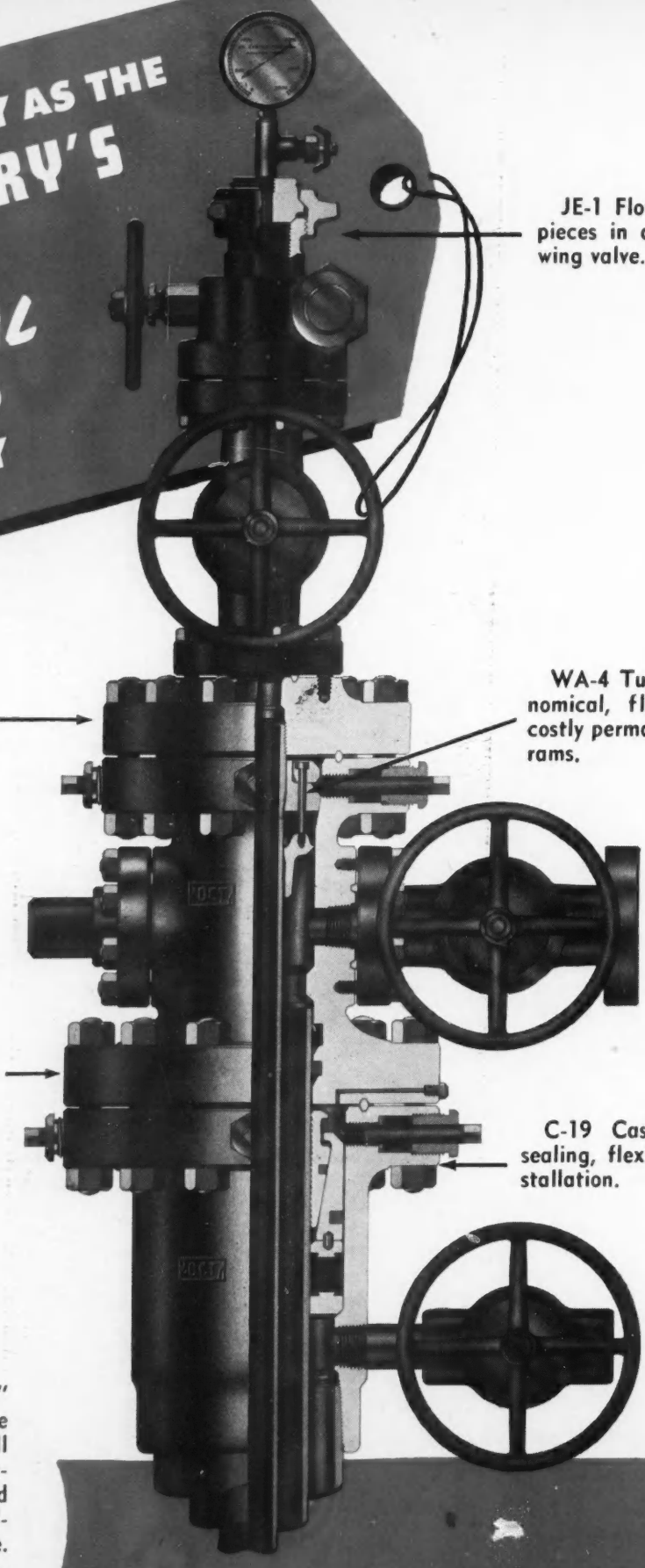

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COLOMBIA

COLOMBIA'S 1948 oil output suffered a slight drop from the 1947 all-time high of 26,020,532 barrels, slumping to 24,371,262 barrels in 1948. The figures include condensate amounting to 907,838 barrels and 578,797 barrels respectively. At the same time a slump of 55 percent was suffered in wells drilled in 1948 as compared with 1947.

For the second time in three years a substantial amount of production has been lost through labor difficulties. The slump in output from Colombia's fields during 1948 can all be attributed to two prolonged strikes, one of 50 days on the De Mares concession, and another of 40 days on the Barco concession. Actually the overall producing potential has shown steady gains, and toward the end of the year daily average production attained a high of 81,453 barrels, which included 2185 barrels of condensate. At this rate Colombia would produce upward of 30 million barrels in 1949, and all indications point to the realization of such a goal.

Late in August the Shell Group's El Difícil field was connected by pipe line to the Andian National Corporation's system and started deliveries at the rate of 3000 barrels daily. This has now increased to more than 5000 barrels. There have also been increased amounts of crude from the Casabe field, which by the end of the year had 69 producers and was making 16,284 barrels a day, an increase of nearly 2000 barrels during the year. Tibú field on the Barco concession at the end of the year was making 16,236 barrels a day to compare with

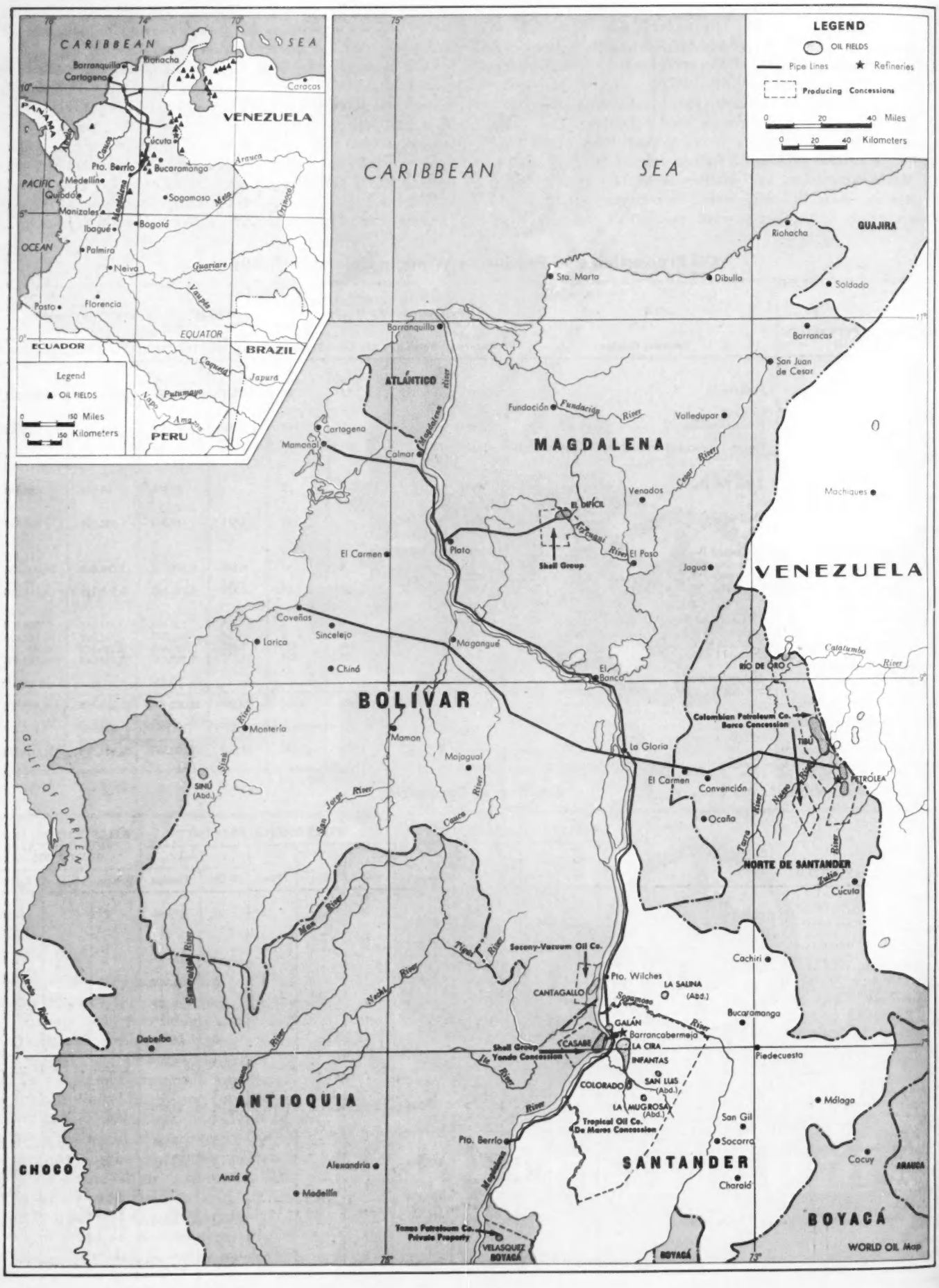
Oil Production and Producing Wells in Colombia Fields

DEPARTMENT, CONCESSION AND FIELD	Operating Company	Year Discovery	PRODUCING OIL WELLS END OF 1948			CRUDE OIL PRODUCTION (Barrels)			
			Flowing	Art. Lift	Total Producing	Daily at End of 1948	Year 1947	Year 1948	Cumulative Through 1948
ANTIOQUIA									
Yondó Concession									
Casabe	Shell Group	1941	17	52	69	16,284	4,779,562	5,672,715	15,438,494
BOLÍVAR									
Cantagallo Concession									
Cantagallo	Socony-Vacuum	1943	2	1	3	1,260	167,612	389,509	700,044
Floresanto Concession									
Sinú	Socony-Vacuum and Tropical Oil Co. (surrendered)	1945	.....	.....	.....	.....	100	.....	.....
BOYACÁ									
Terán Guaguaquí (Freehold)									
Velasquez	Texas Pet. Co. fee	1946	2	.....	2	.....	30,434	48,905	82,541
MAGDALENA									
El Difícil Concession									
El Difícil	Shell Group	1943	11	.....	11	4,851	118,566	583,896	801,552
NORTE DE SANTANDER									
Barco Concession									
Carbonera	Colombian Pet. Co.	1939	.....	.....	.....	.....	8,766	.....	141,103
La Petrólea	Colombian Pet. Co.	1933	39	2	41	8,493	3,516,316	2,786,092	30,003,303
Río de Oro	Colombian Pet. Co.	1920	.....	.....	.....	.....	.....	.....	66,149
Tibú	Colombian Pet. Co.	1940	57	11	68	16,236	4,221,132	5,217,123	14,618,956
SANTANDER									
De Mares Concession									
Colorado	Tropical Oil Co.	1945	2	3	5	226	106,898	74,955	250,872
Galán	Tropical Oil Co.	1945	.....	3	3	94	30,363	27,948	123,039
Infantas	Tropical Oil Co.	1916	2	280	282	7,607	2,983,415	2,340,373	150,008,151
La Cira	Tropical Oil Co.	1926	5	676	681	24,217	9,140,530	6,650,949	228,148,654
Las Monas Concession									
La Salina	Socony-Vacuum	1926	.....	.....	.....	.....	9,000	.....	75,000
Total Crude Oil		.....	137	1,028	1,165	79,268	25,112,694	23,792,465	440,457,858
De Mares Condensate Output		.....	.....	.....	.....	2,185	907,838	578,797	14,511,914
TOTAL		.....	137	1,028	1,165	81,453	26,020,532	24,371,262	454,969,772

Drilling in Colombia

DEPARTMENT AND FIELDS	WELLS COMPLETED IN 1947					WELLS COMPLETED IN 1948					WELLS DRILLING AND SHUT DOWN AT END OF 1948		
				Total					Total				
	Oil	Gas	Dry	Wells	Footage	Oil	Gas	Dry	Wells	Footage	Drilling	S. D.	Total
Antioquia:													
Casabe	18	....	1	19	65,647	18	....	2	20	116,896	5	....	5
Wildcats	....	....	6	6	40,571	....	....	....	....	.....	....	....	....
Atlántico:													
Wildcats	....	....	2	2	11,974	....	....	....	....	.....	1	....	1
Bolívar:													
Cantagallo	....	....	1	1	7,441	....	....	....	....	.....	....	....	....
Wildcats	....	1	2	3	24,383	....	1	4	5	31,356	2	....	2
Boyacá:													
Velasquez	1	....	1	2	15,190	....	....	2	2	16,823	....	....	....
Wildcats	....	....	....	....	.....	....	....	1	1	6,738	....	....	....
Caquetá:													
Wildcats	....	....	....	....	.....	....	....	3	3	14,591	1	....	1
Cundinamarca:													
Wildcats	....	....	....	....	.....	....	....	1	1	1,317	....	....	....
Guajira:													
Wildcats	....	....	....	....	.....	....	....	....	....	.....	1	....	1
Magdalena:													
El Difícil	2	....	....	2	15,228	6	....	....	6	44,678	2	....	2
Wildcats	....	....	4	4	27,521	....	....	3	3	12,325	1	....	1
Meta:													
Wildcats	....	....	3	3	17,913	....	....	2	2	3,753	....	....	....
Norte de Santander:													
Tibú	20	....	2	22	148,434	27	....	1	28	162,336	6	....	6
Santander:													
Colorado	....	....	2	2	6,902	....	....	....	....	.....	....	....	....
Infantas	12	....	1	13	21,124	....	....	....	....	.....	....	....	....
La Cira	79	....	2	81	217,200	....	....	....	....	.....	....	....	....
La Salina	1	....	1	2	8,301	....	....	1	1	3,020	....	....	....
Tolima:													
Wildcats	....	....	....	....	.....	....	....	....	....	.....	2	....	....
TOTAL	133	1	28	162	627,829	51	1	20	72	413,833	21	....	21

COLOMBIA


LEGEND
OIL FIELDS
Pipe Lines
Refineries
Producing Concessions
0 20 40 Miles
0 20 40 Kilometers
CARIBBEAN SEA
VENEZUELA
PACIFIC OCEAN
ECUADOR
BRAZIL
PERU
EQUATOR
Legend
OIL FIELDS
150 Miles
150 Kilometers
GUAJIRA
Riohacha
Sta. Marta
Dibulla
Soldado
Barranquilla
Barrancas
San Juan de Cesar
ATLÁNTICO
Fundación
Valledupar
Cartagena
Mamonal
Calmar
MAGDALENA
Venados
Machiques
EL DIFICIL
Shell Group
El Carmen
Plato
El Paso
Jagua
VENEZUELA
Coveñas
Sincelejo
Lorica
Magangué
Chinú
El Banco
RÍO DE ORO
BOLÍVAR
Montería
Mamon
Mojagual
La Gloria
Colombian Petroleum Co. Barco Concession
TIBÚ
PETRÓLEA
El Carmen
Convención
Ocaña
SINÚ (Abd.)
GULF OF DARIEN
NORTE DE SANTANDER
Cúcuta
Socony-Vacuum Oil Co.
Cachiri
Pto. Wilches
CANTAGALLO
LA SALINA (Abd.)
Bucaramanga
GALÁN
Barrancabermeja
CASABE
LA CIRA
INFANTAS
Shell Group Yondo Concession
Piedecuesta
COLORADO
SAN LUIS (Abd.)
LA MUGROSA (Abd.)
Tropical Oil Co. De Mares Concession
Málaga
San Gil
Socorro
Pto. Berrío
Dabeiba
ANTIOQUIA
SANTANDER
Cocuy
ARAUCA
CHOCÓ
Alexandria
Anzá
Medellín
Charalá
Tenco Petroleum Co. Private Property
VELASQUEZ BOYACÁ
BOYACÁ
BOYACÁ
WORLD OIL Map

COLOMBIA—Continued

13,596 barrels a day at the beginning of 1948. Texas Petroleum Company's new Velasquez field, although it has only two producers, accounted for 48,905 barrels in 1948 and early in 1949 started making barge deliveries down the river to Tropical Oil Company's refinery at Barrancabermeja, it is starting at 700 barrels daily. Of five wells drilled at Velasquez to date, three have been dry. Drilling is being held up while further geophysical investigation of the area is being made.

Very little change in drilling was noted in most areas, the single contributor to the decline being Tropical Oil Company at De Mares. In 1947 162 wells were drilled in Colombia of which 96 were on the De Mares concession. In 1948 no wells were drilled there, although Tropical has been active in its exploratory campaign elsewhere in the nation.

Wildcatting dropped off only slightly with 16 such tests in 1948 as against 18 in 1947, but without success except for a gas well in the State of Bolívar which showed 29 million cubic feet daily, but which has no market. The year marked decision by the Shell group to suspend operations in the Llanos after having spent an estimated $10 million drilling 11 dry holes. Texas Petroleum has started its wildcat campaign in the equatorial regions of extreme southern Colombia, drilling three dry holes during the year, all of which had showings of heavy oil.

Refining capacity is still concentrated in two plants, the 17,000-barrel refinery operated by Tropical Oil Company at Barrancabermeja, and the 700-barrel refinery operated by Colombian Petroleum Company on the Barco concession.

Pipe line construction completed during the year included the Shell's 48-mile combination 6- and 8-inch line connecting El Difícil field to Plato station. Preliminary work is being done toward building the remaining links of the proposed system of products lines to tie the consuming centers of central Colombia in with the Tropical refinery so that deliveries can be made independently of water conditions on the Magdalena River. A line is also planned to connect the west coast port of Buenaventura with Cali.

Pipe Lines of Colombia

COMPANY	Origin	Terminus	Lgth. Miles	Diam. Inches	Year Completed	Capacity Bbls. Daily	Status
Crude Oil Lines:							
Andian National Corp. (Tropical)	Barranca-bermeja	Mamonál (Cartagena)	334	2-10	1926	57,000	In use
Cía. Colombiana de Petróleo El Condor (Shell Group)	Casabe	Galán	8	8	1945	20,000	In use
Cía. de Petróleo La Estrella de Colombia (Shell Group)	El Difícil	Plato	48	6-8	1948	7,000	In use
South American Gulf Oil Corp. (Colombian Pet. Co.)	Petrólea (Barco)	Coveñas	261.6	12	1939	25,000	In use
Socony-Vacuum Oil Co. of Colombia	Cantagallo	Pto. Wilches	1.5	4	1947	1,000	In use
Products Lines:							
Colombian Government	Pto. Berrío	Pto. Salgár	88	6	....	.....	Planned
Colombian Government	Buenaventura	Cali	75	6	....	.....	Planned
State of Antioquia	Pto. Berrío	Medellín	80	6	....	.....	Planned
State of Caldas	Pto. Salgár	Manizales	56	6	....	.....	Planned
Tropical Oil Co.	Barranca-bermeja	Pto. Berrío	56	6	1947	7,200	In use

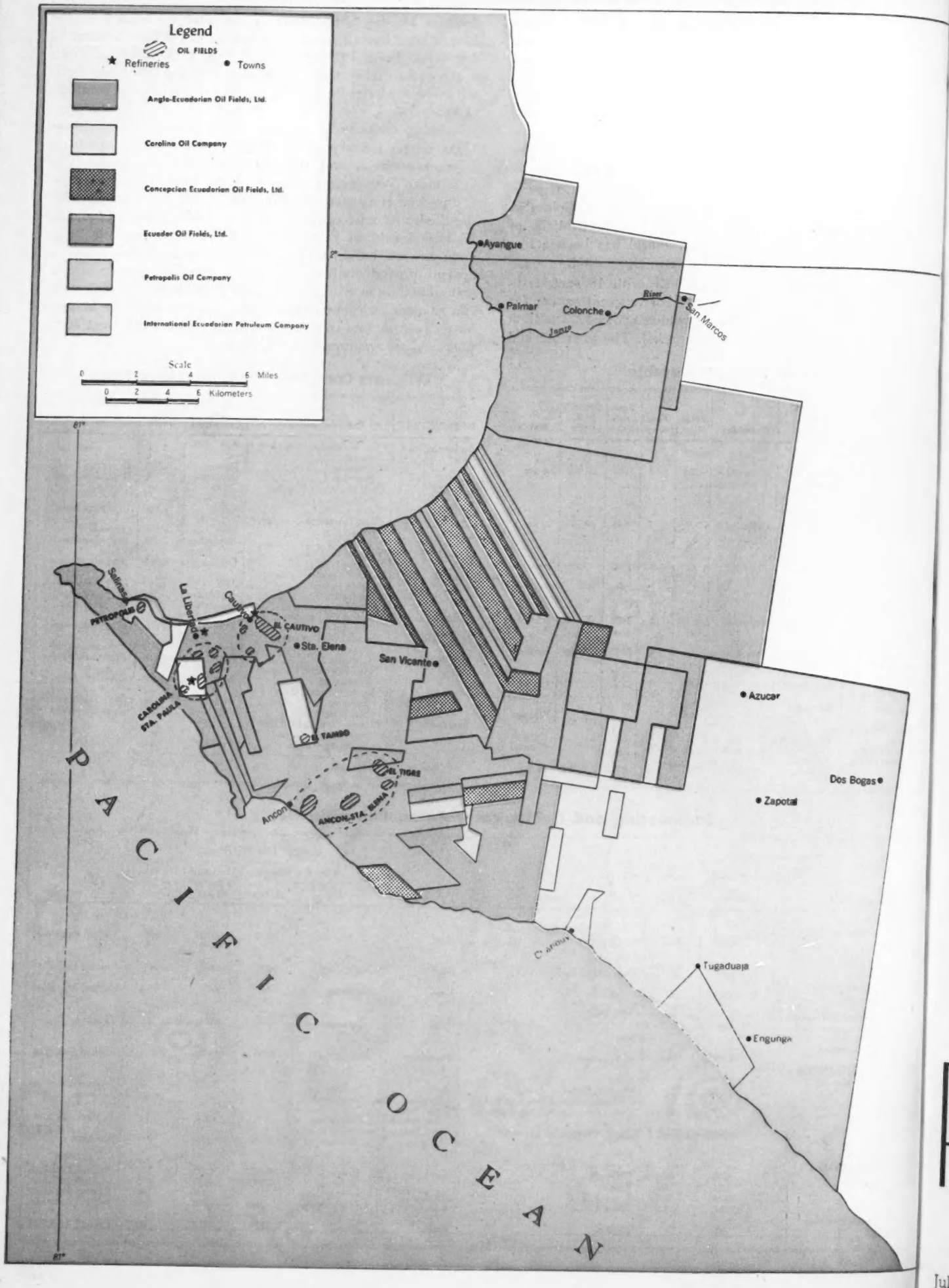
Wildcats Completed in Colombia in 1948

DEPARTMENT	Company and Well	Date Completed	Total Depth	Results
Antioquia	Cía. de Petróleo Shell (& Socony)			
	Rompida 1	November	5,590	Dry; abandoned
	Rompida 2	December	1,773	Dry; abandoned
Bolívar	Cías. Unidas de Petróleo (Sinclair)			
	San Andres 1	April	7,365	Dry; abandoned
	Texas Petroleum Company			
	Jobo 1	May	6,944	Gas well
	Jobo 2	November	7,504	Dry; abandoned
Boyacá	Tropical Oil Company			
	Tunja 1	October	6,983	Dry; abandoned
Caquetá	Texas Petroleum Company			
	Solita 1	July	3,740	Dry; abandoned
	La Rastra 1	September	3,094	Dry; abandoned
	Curbinata 1	December	3,117	Dry; abandoned
Cundinamarca	Tropical Oil Co. (and Texas)			
	San Antonio 1	June	8,570	Dry; abandoned
Magdalena	Tropical Oil Company			
	Papayal 1	January	2,577	Dry; abandoned
	Granada 2	March	4,504	Dry; abandoned
	Texas Petroleum Company			
	Buenavista 1	April	11,590	Dry; abandoned
Meta	Cía. de Petróleo Shell			
	Voragine 1	March	6,482	Dry; abandoned
	San Martín 5	July	7,996	Dry; abandoned
Santander	Socony-Vacuum Oil Company			
	La Salina 4	January	5,035	Dry; abandoned
Total	16 wells		92,864	

Engineering and Geological Data on Colombia Fields

Department, Concession and Field	Proved Area (Acres)	Range of Gravity Oil (API)	Name	Kind	Age	DEPTH, (Feet) Minimum to Top of Pay	DEPTH, (Feet) Maximum to Bottom of Pay	Average Thickness of Pay (Feet)	Type of Structure
ANTIOQUIA									
Yondó Concession									
Casabe	5,000	20.7	La Cira, Colorado	Sand	L. Mio.-Olig.	2100	3772	300	Faulted Anticline
BOLIVAR									
Cantagallo Concession									
Cantagallo	550	20	Esmeraldas, La Paz	Sand	Olig.-Eoc.	6006	6400	160	Faulted Anticline
Floresanto Concession									
Sinú	250	50	Pajuil	Sand	Miocene	650	2300	37.5	Faulted Anticline
BOYACA									
Terán-Guaguaquí (Freehold)									
Velasquez	400	25		Sand	Tertiary	6700	8455	85	Anticline
MAGDALENA									
El Difícil Concession									
El Difícil	2,500	44.6	El Difícil	Limestone	Oligocene	5500	6100	28	Faulted Anticline
NORTE DE SANTANDER									
Barco Concession									
Carbonera	500	21	Cuerros, Barco	Sand	Eocene	....	3359	10	Faulted Anticline
Petrólea	4,200	45	La Luna, Ostea, Zones 1, 2, 3, 4	Limestone	Cretaceous	99	1953	33	Anticline
Río de Oro	420	39	Catatumbo, Río de Oro, Uribante	Shale, Sand, Limestone	Cretaceous	....	1865	21	Faulted Anticline
Tibú	8,000	31	Barco, Catatumbo, Uribante	Sand, Shale, Limestone	Tertiary, Cretaceous	4300	10,876	100	Anticline
SANTANDER									
De Mares Concession									
Colorado	270	37.6	Colorado	Sand	Eocene	3400	4200	200	Faulted Anticline
Galán	426	19.5	Zone A		Oligocene	3900	4050	125	Faulted Anticline
Infantas	5,750	26.3	Zones A, B, C	Sand	Olig.-Eocene	300	2600	390	Faulted Anticline
La Cira	12,265	24.5	Zones A, B, C	Sand	Olig.-Eocene	200	4300	382	Faulted Anticline
Las Monas Concession									
La Salina	400	21	Lisama	Sand	Eocene	1770	4378	20	Faulted Anticline

ECUADOR—Santa Elena Fields and Concessions



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THROUGH a drilling program resulting in the completion of 60 field wells, Ecuador has halted its production decline of the past few years. During 1948 the fields of Santa Elena Peninsula yielded a total of 2,610,719 barrels, a figure which had been exceeded only in 1944 and 1945.

Most of the increase in production has been made possible by the development of a new shallow area at Santo Tomas, a part of the Ancón field, where wells are completed at depths from 960 to 1860 feet for initial production averaging about 90 barrels daily per well. Anglo-Ecuadorian Oilfields Limited drilled 15 wells in the Santo Tomas zone.

Actual output might have been increased still further but for labor disturbances in the middle of the year resulting in a month-long general strike and considerable additional loss of time and efficiency before being settled. Further retarding factor is the general shortage of materials being experienced by many of the British firms operating in relatively small producing areas. Many wells remain off production because of the lack of production equipment. It has become the practice to strip such equipment from smaller producers in order to place better wells on stream.

An increase was effected in Ecuador's refining capacity by activation of a new unit in the La Libertad refinery, bringing it up from 2700 to 5200 barrels daily.

There are still no concrete results from Shell Group's intensive exploration campaign in the difficult "Oriente" region east of the Andes. However, Shell has been joined by Esso Standard Oil Company (Ecuador) S. A. and prospecting will be continued as a joint enterprise. During the year Shell completed three dry wildcats at widely separated points in the Oriente, its Cangaime 1 in the southwestern part of the concession being completed at 3540 feet, the Oglan 1 in the west central part at 9438 feet, and the Tiputini 1 in the extreme east at 5515 feet. Early in 1948 preparations were being made to spud Villano 1 in the west central part of the Oriente.

During the year half of the 19,768,000-acre concession was released and the two companies will prospect the remainder.

Crude Oil Pipe Lines of Ecuador

COMPANY	Origin	Terminus	Length (Miles)	Diameter (In.)	No. of Pump Stations	Capacity of Line (Bbls. Daily)	Year Completed	Status
Anglo-Ecuadorian Oilfields, Ltd.	Ancón	La Libertad	8	6	1	12,960	1925	Operating
Carolina Oil Co.	Santa Paula	Carolina	3	4	2	2400	....	Operating
Ecuador Oilfields, Ltd. (British Controlled Oilfields, Ltd.)	Tigre	Cautivo	11	4	1	2500	1940	Operating
	Cautivo	Anglo tank-farm and submarine line	2	8-10	None	30,000	1940	Operating
	Cautivo	Anglo-tank-farm and submarine line	2	10	....	....	....	Planned
Petrópolis Oil Co.	Salinas	Libertad	8	4	1	3600	1940	Operating

Drilling in Ecuador

Province and Field	WELLS COMPLETED IN 1948				
	Oil	Gas	Dry	Total Wells	Total Footage
Guayas:					
Ancón	31	..	..	31	47,411
Carolina-Santa Paula	7	..	..	7	4,444
Concepción	5	..	1	6	4,526
El Tigre, El Cautivo	5	..	6	11	25,020
Petrópolis		..	..	5	5,290
Wildcats	5	..	3	3	18,493
Total	53	..	10	63	105,184

Refineries of Ecuador

Company	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Type of Refinery	Operating Status
Anglo-Ecuadorian Oilfields, Ltd.	La Libertad, (100 mi. w. Guayaquil)	5200	None	Skimming (One lb. oil cut)	Enlarging
Ecuador Oilfields, Ltd.	Cautivo (Guayas, 90 mi. from Guayaquil)	582	None	Skimming	Operating

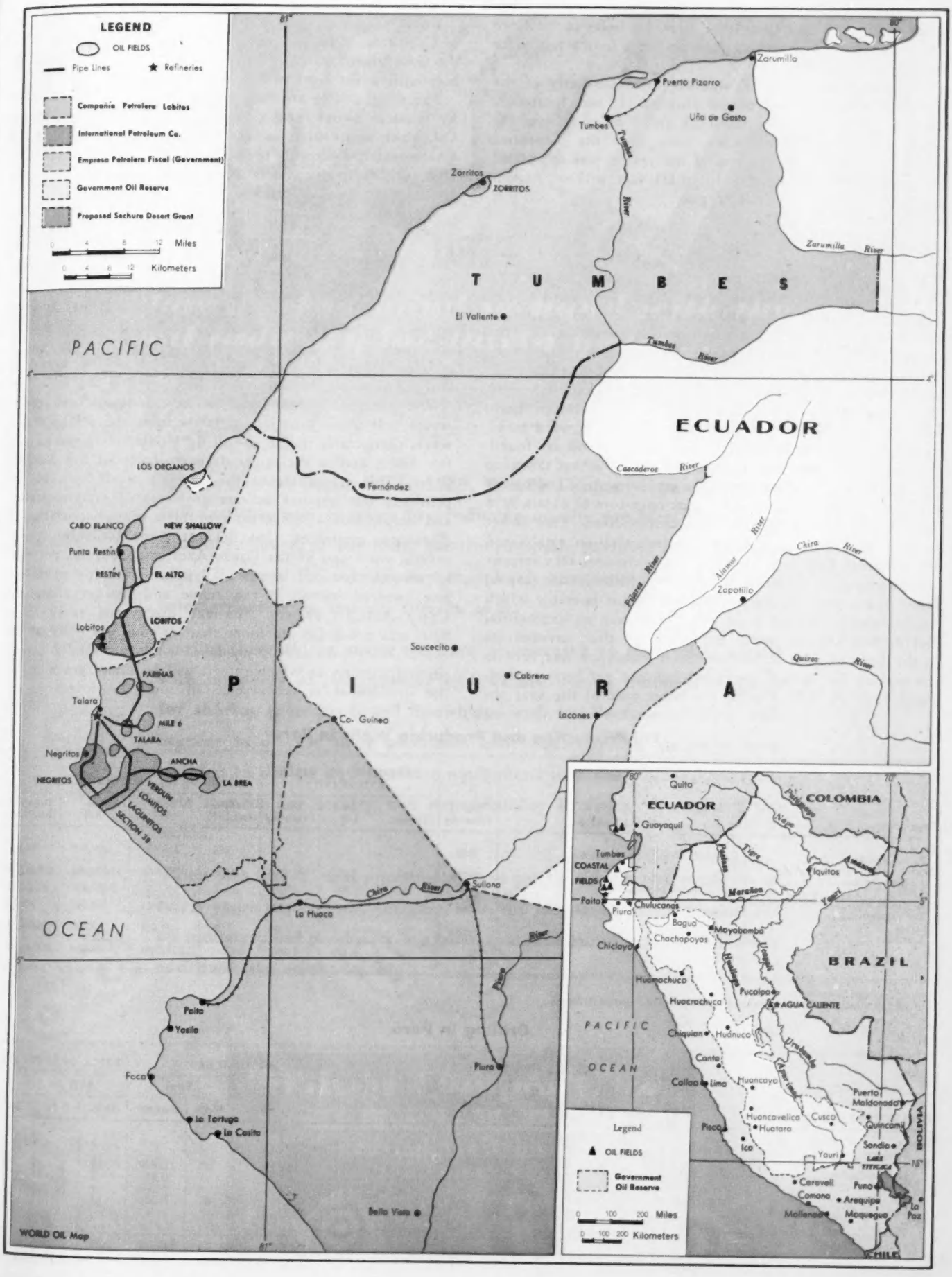
Oil Production and Producing Wells in Ecuador

PROVINCE AND FIELD	Operating Company	Year of Discovery	PRODUCING OIL WELLS END OF 1948			CRUDE OIL PRODUCTION (Barrels)			
			Flowing	Art. Lift	Total Producing	Daily at End of 1948	Year 1947	Year 1948	Cumulative Through 1948
Guayas:									
Ancón	Anglo-Ecuadorian Oilfields, Ltd.	1921	....	....	....	....	1,627,153	1,724,340	38,239,726
Carolina-Santa Paula	Carolina Oil Company	....	....	....	....	....	90,514	84,841	1,129,297
Concepción	Concepción Ecuadorian Oilfields, Ltd.	1931	....	....	....	....	86,357	91,912	833,889
Petrópolis	Petrópolis Oil Company	1937	....	....	....	....	72,197	59,427	747,743
El Tigre	Ecuador Oilfields, Ltd.	1928	....	....	....	....	550,229	650,199	4,465,311
El Cautivo		1920	....	....	....	....			
Total		....	....	....	771	....	2,426,450	2,610,719	45,415,996

Engineering and Geological Data on Ecuador Oil Fields

PROVINCE AND FIELD	Proved Area (Acres)	Gravity of Oil (API)	PRODUCING FORMATION			Depth of Wells (Ft.)		Type Structure
			Name	Kind	Age	Minimum to Top of Pay	Maximum Total Depth of Wells	Avg. Thickness of Pay (Ft.)	
Guayas:									
Ancón-Sta. Elena	18,000	37-41	Socorro	Sandstone	Eocene	1200	4000	600	Faulted anticline
			Atlanta			3000	6000	2500	
Carolina-Sta. Paula	....	28-31	Socorro	Sand	Eocene	632	836	200	Steeply dipping erratic blocks
Concepción	....	38	Atlanata	Sand	Eocene	1100	3570	....	Structural strat. trap
El Cautivo	....	39-44	Socorro	Sand	Eocene	750	1000	250	Steeply dipping erratic blocks
El Tambo	....	....	Socorro	Sand	Eocene	....	4000	....	Structural strat. trap
El Tigre	200	39	Atlanta	Sand	Eocene	2900	4300	400	Structural strat. trap
Petrópolis	100	35	.....	Shattered Chert	Eocene	....	2000	....	Steeply dipping erratic blocks

PERU


LEGEND
OIL FIELDS
Pipe Lines
Refineries
Compañía Petrolera Lobitos
International Petroleum Co.
Empresa Petrolera Fiscal (Government)
Government Oil Reserve
Proposed Sechura Desert Grant
Miles
Kilometers
PACIFIC
OCEAN
TUMBES
PIURA
ECUADOR
COLOMBIA
BRAZIL
BOLIVIA
CHILE
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Puerto Pizarro
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Zorritos
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Fernández
LOS ORGANOS
CABO BLANCO
NEW SHALLOW
Punta Restín
RESTÍN
EL ALTO
Lobitos
LOBITOS
PARIÑAS
Talara
MILE 6
TALARA
Negritos
NEGRITOS
ANCHA
LA BREA
VERDUN
LOMITOS
LAGUNITOS
SECTION 28
Saucecito
Cabrena
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Lacones
Zapotillo
Sullana
La Huaca
Paita
Yasila
Foca
La Tortuga
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Piura
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Chira River
Quiros River
Tumbes River
Zarumilla River
Quito
Guayaquil
Tumbes
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Iquitos
Paita
Piura
Chulucanas
Bagua
Moyobamba
Chachapoyas
Chiclayo
Huamachuco
Pucalpa
Huacrachuca
AGUA CALIENTE
Chiquian
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Pisco
Ica
Cusco
Puerto Maldonado
Quincamil
Sandia
Yauri
Caraveli
Puno
Arequipa
Camana
Mollendo
Moquegua
La Paz
Legend
OIL FIELDS
Government Oil Reserve
Miles
Kilometers
WORLD OIL Map

PARAGUAY

UNION Oil Paraguay is continuing it ssearch for oil with its series of deep wildcat wells started in the middle of 1946. Since that time it has completed three dry holes in the Gran Chaco region, and is making location for a fourth test to be started early in 1949.

The third test, Pirizal 1, was the most southerly of the wells drilled under the current program. It was located in the southern Chaco, 75 miles south and 9 miles west of the town of Mariscal Estigarribia, very near the Argentine border. Shortly before the end of the year it was completed as a dry hole after drilling to 10,331 feet without finding appreciable showings of oil or gas.

The fourth wildcat will be started during 1949 in the northwest Chaco near the town of Picuiba.

Union Oil Paraguay is a subsidiary of Union Oil Company of California, formed in accordance with a decree issued by the Government which required that operators form separate corporations for work within Paraguay.

The drilling sites are selected following geophysical work by Western Geophysical Company under contract to Union Oil, which keeps three parties working in various parts of the Chaco region. Following preliminary geophysical work in any area, the company selects 24,700-acre blocks which carry 18-month drilling obligations.

PERU

PERU'S crude oil production climbed in 1948 to 14,068,916 barrels, the highest it has attained since the rates reached in 1943 and 1944 under the pressure of war requirements. This output has been reached without the discovery of new producing fields, although it represents some additional flush production found through the continual prospecting around the edges of the established fields in northwestern Peru. Little hope is held for a continuation of the upward trend in output unless some entirely new sources of oil are found. At the close of the year there had been no action taken on new legislation to allow expansion on the part of companies presently operating, or to allow new operators to obtain firm concessions for exploration and development. The decree early in the year by which the Administration established the Empresa Petrolera Fiscal as a Government oil company empowered to enter into agreements with outside capital failed in its purpose. Apparently any major operator which would have to expend great sums of money on exploration and drilling desired better guarantees of their investments in the form of firm legislation. Such legislation has been in the making for several years but had not yet been promulgated early in 1949. During the latter part of the year the Government appointed a commission to draft a new petroleum law, and at the end of the year the group was at work on such a bill. The commission includes, in addition to Government people, representatives of oil companies, and it is hoped that a bill will be forthcoming which would be acceptable to all parties.

The greatest present need is for statutory background which will allow granting of lands from the National Reserve, particularly in the so-called "Montaña" region east of the Andes and in the upper drainage basin of the Amazon River. This is considered the nation's most favorable oil province, but imposes serious problems of communication and supply, and a still greater problem of transportation of discovered resources. One field at Agua Caliente, opened several years ago by the Ganso Azul company, has potential of several thousand barrels daily, but is restricted to the few hundred barrels it can refine and market along the Upper Amazon system. Although discovered in 1932, the field was producing no more than 389 barrels daily at the end of 1948, and has only produced a total of 424,212 barrels since discovery, at which rate it will be many years before the investment is recovered. Oil must be found in the

Oil Production and Producing Wells in Peru

Department and Field	Operating Company	Year of Discovery	PRODUCING OIL WELLS END OF 1948			CRUDE OIL PRODUCTION (Barrels)			
			Flowing	Art. Lift	Total Producing	Daily at End 1948	Year 1947	Year 1948	Cumulative Through 1948
Huánuco									
Agua Caliente	Compañía de Petróleo Ganso Azul	1932	7	.....	7	389	118,001	120,810	424,212
Piura									
La Brea-Pariñas	International Pet. Co.	1875	203	2,273	2,476*	32,000	10,205,658	11,362,498	299,841,756
Lobitos	Cía. Petrolera Lobitos	1901	59	867	926	6,670	778,651	2,472,969	67,567,910
Restín-El Alto		1904					1,543,325		
Los Organos	Empresa Petrolera Fiscal	1943	....	14	14	312	105,661	104,349	462,418
Tumbes									
Zorritos	Empresa Petrolera Fiscal	1865	....	42	42	23	12,513	8,290	3,549,770†
Total			269	3,196	3,465	39,394	12,763,809	14,068,916	371,846,066

* Includes 29 gas wells.
† Includes 3,214,468 bbls. produced by old Sociedad Faustino G. Paggio.

Drilling in Peru

DEPARTMENT AND FIELD	WELLS COMPLETED IN 1947					WELLS COMPLETED IN 1948					WELLS DRILLING AND SHUT DOWN AT END OF 1948		
	Oil	Gas	Dry	Total Wells	Total Footage	Oil	Gas	Dry	Total Wells	Total Footage	Drlg.	S.D.	Total
Loreto													
Wildcats	....	....	1	1	2,600	....	....	1	1	1,000	1	1	2
Piúra													
La Brea-Pariñas	70	....	32	102	345,237	77	5	40	122	412,979	16	....	16
Lobitos	8	....	....	8	15,439	9	....	....	9	17,361	3	....	3
Los Organos	5	....	1	6	7,807	5	....	1	6	8,060	2	....	2
Restín-El Alto	32	....	5	37	76,070	36	....	1	37	77,322	14	1	15
Puno													
Pirín	....	....	2	2	3,590	....	....	....	....	.....	.....	1	1
Total	115	....	41	156	450,743	127	5	43	175	516,722	36	2	39

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PERU—Continued

Montaña in quantities sufficient to justify building a pipe line to a coast terminal.

During the year some surface geological work was carried on in the eastern region by Socony-Vacuum Oil Company and by International Petroleum Company, and the latter engaged in some geophysical work on the La Brea-Pariñas Estate, the property on which their producing fields are located. The fields at Talara are of such nature that continual exploratory drilling is necessary around the edges to bring new areas into production. The structures show some of the most complex faulting known, and require close coordination between subsurface geologists and the drilling department. During the past year six rigs were kept busy on exploratory drilling of this nature.

International, the largest single operator in Peru, produced a total of 11,362,498 barrels of crude from its properties, and at the end of the year was producing at a rate of 32,000 barrels daily, most of which is processed in its modern refinery at Talara which has a capacity of 30,000 barrels daily. The fields, although the oldest in South America, are kept producing at high levels through the most modern operation of both primary and secondary recovery methods.

The Compañía Petrolera Lobitos, which operates the Lobitos properties to the north of International's fields, accounts for nearly 7,000 barrels of Peru's 39,394-barrel daily output, and maintains an active drilling campaign. The Empresa Petrolera Fiscal has a small amount of production from the Los Organos and Zorritos areas, and does a small amount of drilling.

Drilling volume in Peru during 1948 showed a substantial increase over 1947, with 175 wells completed compared to 156 in the previous year. International completed 122 wells, showing a high percentage of dry holes due to the amount of exploratory drilling in its complicated fault blocks. Forty of its wells were dry. The Lobitos company drilled 37 wells, the same number as in 1947, but showed a slight increase in footage drilled. The total footage drilled in Peru during the year amounted to 516,722 feet, the highest in history, with 412,979 feet of this drilled by International. Footage has increased through the past few years as rotary rigs have replaced the many cable tool outfits formerly employed in this area.

Wildcatting on the eastern side of the Andes was limited to one well drilled by the Peruvian Government which was junked at 1000 feet without having reached a depth sufficient to find anything conclusive, and another wildcat test started by the Compañía Peruana de Petróleo "El Oriente," its Inca 1, which was drilling below 3500 feet at the end of the year. This company, organized by local capital, holds some small concessions in the Montaña on which it drilled a shallow 2600-foot well in 1947. These tests, as well as that started by the Government are located in the general area of the town of Contamana.

Another interesting area is that in which lies the Sechura Desert tract upon which International Petroleum Company's bids were accepted by the Government, but which requires congressional action before final contracting. This region is more interesting to International than some others, due to its proximity to the company's present base of operations, requiring no excessive outlay for transportation such as will be necessary in the Montaña.

Refineries of Peru

COMPANY	Location of Plant	Crude Charging Capacity, (Bbls. Daily)	Cracking Capacity, (Bbls. Daily)	Type of Refinery	Operating Status
Cía. Ganso Azul	Agua Caliente	1,000	None	Skimming	Operating
Compañía Petrolera Lobitos	Lobitos	100	None	Skimming	Operating
International Pet. Co.	Talara	30,000	2,000	Complete	Operating
Refinería Villar; Empresa Petrolera Fiscal	Zorritos	1,200	None	Skimming	Operating

Engineering and Geological Data on Peru Fields

Department and Field	Proved Area (Acres)	Range of Gravity Oil (A.P.I.)	Name	Kind	Age	DEPTH (FT.) Minimum to Top of Pay	DEPTH (FT.) Maximum to Bottom of Pay	Average Thickness of Pay (Feet)	Type of Structure
Huánuco									
Agua Caliente	1,000	44.4	Agua Caliente Sandstone and Ash bed	Sand	L. Cretaceous	1000	1300	100	Dome
Piura									
La Brea-Pariñas	20,000	37.2	Verdun-Talara Pariñas-Salina-Negritos	Sand	Eocene	60	6000	170	Faulted & Folded
Lobitos	5,000	36.5	Terebratula-L. Caverno	Sand	U. Eocene	142	6500	....	Block Faulting
Los Organos	250	44.	Talara and Lomitos conglomerates	Sand	U. Eocene	1800	2400	30	Monocline & Block Faulted
Restín-El Alto	10,000	36.5	Terebratula-L. Caverno	Sand	U. Eocene	100	6600	....	Block Faulting
Tumbes									
Zorritos	1,000	38.	L. Zorritos	Sand	Miocene	1200	1800	20	Monocline & Block Faulted

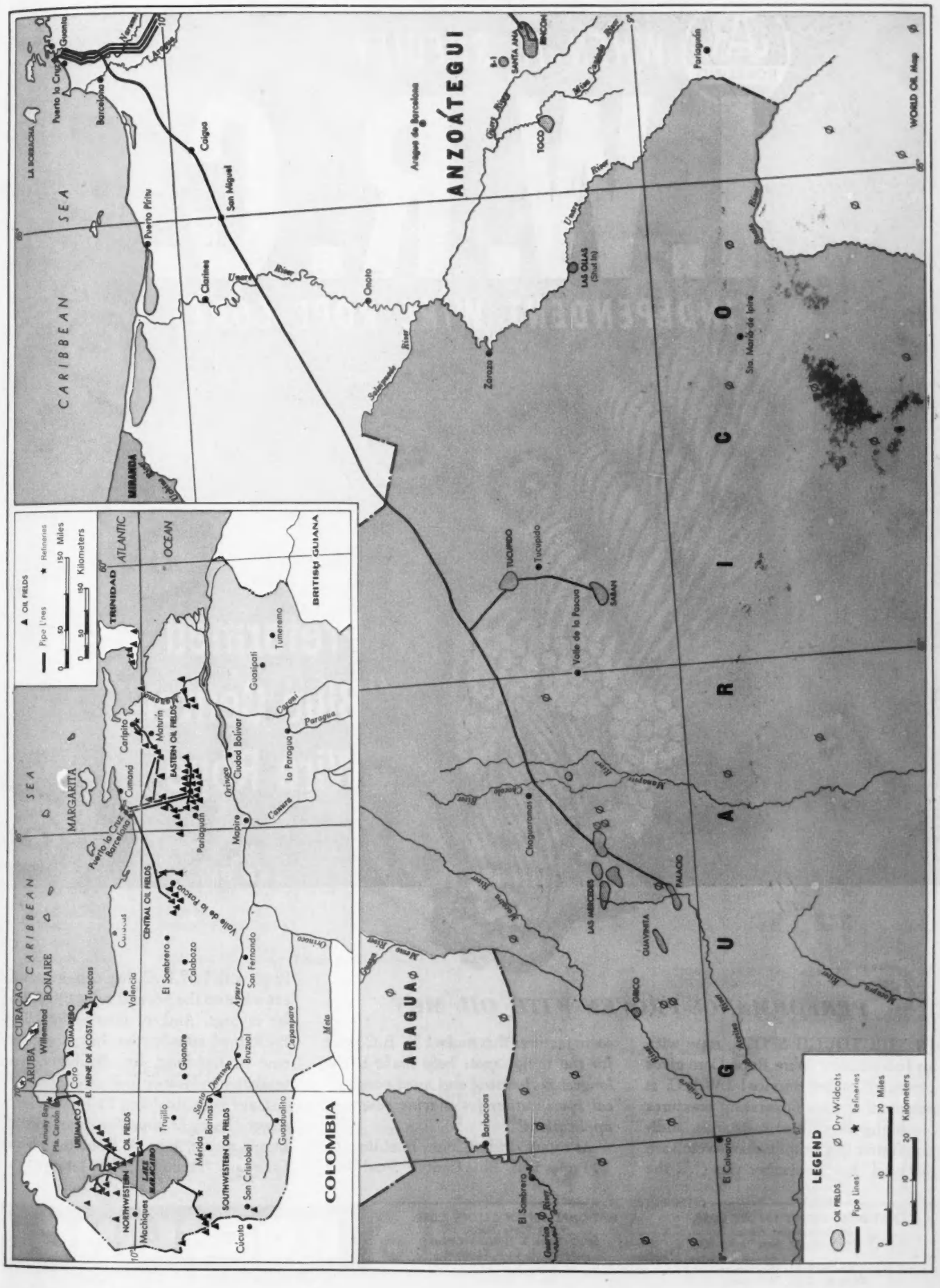
URUGUAY

URUGUAY'S petroleum industry is limited to a Government-owned refinery and some surveying of its territory for the possibility of finding some sources of oil production. Thus far no producing sources of oil have ever been established within its boundaries.

All mineral resources in Uruguay belong to the State and are under the direction of the Inspección General de Minas. The importing and refining of crude oil is also a monopoly under the direction of the State and is handled by the Administración Nacionál Combustible Alcohol y Portland. This agency, created in 1931, has control of alcohol and cement as well as petroleum and its products. A modern refinery is located at Montevideo, formerly capable of processing 8,000 barrels daily, but through additions constructed during the latter part of 1947 and 1948, its capacity has been brought up to 10,000 barrels daily. However, it is likely that the nominal capacity will be increased since before the end of 1948 it was handling as much as 14,000 barrels daily for periods of 30 days. This gives the nation capacity to take care of all its needs of products so that, with the exception of some special products, imports can be limited to crude oil.

A firm of American consultants were engaged by Uruguay during the latter part of 1948 to undertake a survey of the country's oil possibilities, with a view to making recommendations for a program of detailed geophysical work. The project will include studies and evaluation of previous surveys, and will call for about three years of work, concentrating in the northern part of the country where most favorable indications have been found.

VENEZUELA—Central Fields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COLOMBIA
Puerto la Cruz
Barcelona
Cumaná
Caripito
Maturín
EASTERN OIL FIELDS
Guaiparo River
Guaiparo
Tucacas
Valencia
El Sombrero
Calabozo
CENTRAL OIL FIELDS
Valle de la Pascua
Ciudad Bolivar
Tucupido
Zaraza
Maracay
Willemstad
Coro
El Mene de Acosta
Cumarebo
Guanare
Trujillo
Mérida
Barinas
Bruzual
San Fernando
Apure
Orinoco
Meta
Guasdualito
San Cristobal
Cúcuta
Mochiques
LAKE MARACAIBO
NORTHWESTERN OIL FIELDS
SOUTHWESTERN OIL FIELDS
Amuay Bay
Pta. Carolin
URIJAMACO
Barcelona
Puerto Piritu
Cariaco
San Miguel
Clarines
Onoto
Araguo de Barcelona
Santa Ana
Bacon
Toco
Pariaguán
Las Ollas (Shell Bn)
Sta. María de Ipira
Tucupido
Valle de la Pascua
Tumeremo
Guaiparo
Paragua
Mapire
Casiquiare
Chaguaramas
Las Mercedes
Palacio
Guayneta
Garco
Barbacoas
El Sombrero
El Calvario
Quarico River
Orinoco River
Caroni River
Manapire River
Portuguesa River
Apure River
Meta River
Cojedes River
Unare River
Neverí River
Aragua River
Guarico River
Tuy River
Pao River
Morichal Largo River
Caris River
Guanipa River
Amana River
Tigre River
Caratal River
Yuruari River
Caura River
Caroni River
Paragua River
Aro River
Caura River
Suapure River
Ventuari River
Orinoco River
Sarare River
Zulia River
Catatumbo River
Escalante River
Motatan River
Santa Ana River
Bocono River
Tocuyo River
Yaracuy River
Aroa River
Tocuyo River
Pedregal River
Mitare River
Caujarao River
Matatere River
Mitare River
Pedregal River
Aroa River
Yaracuy River
Tocuyo River
Bocono River
Santa Ana River
Motatan River
Escalante River
Catatumbo River
Zulia River
Sarare River
Orinoco River
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Garco
Guayneta
Palacio
Las Mercedes
Chaguaramas
Mapire
Ciudad Bolivar
Orinoco
Casiquiare
Paragua
Caroni
Guaiparo
Tumeremo
Guaiparo River
Caripito
Maturín
EASTERN OIL FIELDS
Cumaná
Puerto la Cruz
Barcelona
Pariaguán
Valle de la Pascua
Tucupido
TUCUPIDO
SABAN
Zaraza
Sta. María de Ipira
Pariaguán
LAS OLLAS (Shell Bn)
Toco
Bacon
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Aroa River
Yaracuy River
Pedregal River
Mitare River
Caujarao River
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VENEZUELA

PRODUCTION of crude oil in Venezuela again broke all previous records as output for 1948 reached a total of 489,984,863 barrels, or 1,338,756 barrels daily over the year, 12 percent more than in 1947. With sharp increases in demand production rose steadily from 1,247,500 barrels at the end of 1947, to 1,406,000 barrels daily late in November, but

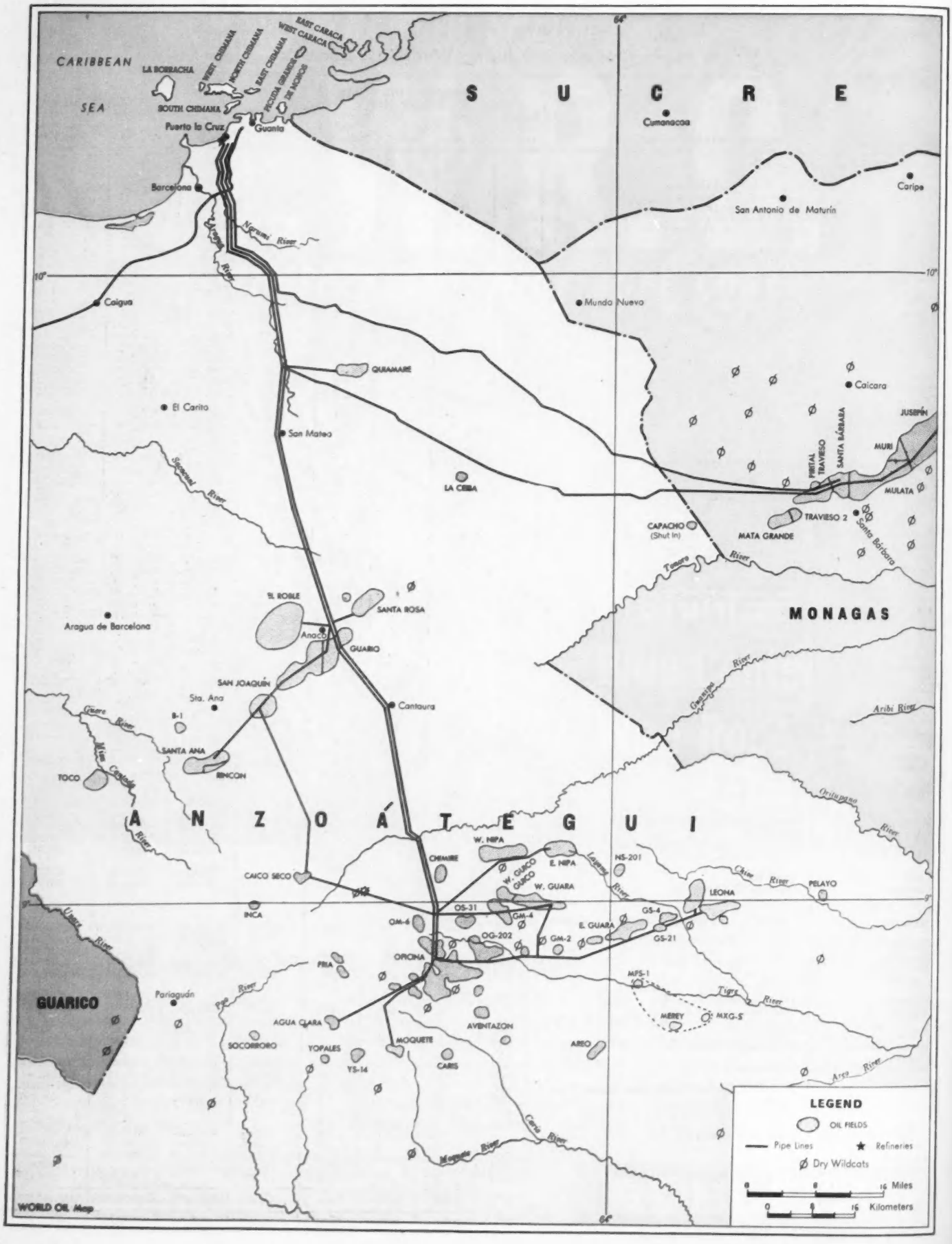
Oil Production and Producing Wells in Venezuela

State and Field	OPERATING COMPANY	Year of Discovery	PRODUCING OIL WELLS END OF 1948			Daily at End 1948	CRUDE OIL PRODUCTION (Barrels)		
			Flowing	Art. Lift	Total Producing		Year 1947	Year 1948	Cumulative Through 1948
EASTERN VENEZUELA:									
Anzoategui									
Chimire	Socony-Vacuum Oil Company	1948	2	....	2	1,147	.....	221,678	221,678
Fria	Mene Grande Oil Company	1948	6	....	6	1,592	.....	348,593	348,593
Guara	Creole Pet., Mene Grande	1942	164	36	200	74,573	28,382,729	27,886,876	109,390,174
Guico	Socony-Vacuum Oil Company	1944	45	3	48	15,894	6,221,943	6,187,190	20,589,075
Leona	Mene Grande Oil Company	1940	19	1	20	6,013	1,459,746	1,940,921	28,420,508
Merey-Areo		1934	1	2	3	725	.....	121,526	121,526
Nipa	Creole Pet., Mene Grande, Socony-Vacuum	1945	57	4	61	29,615	3,853,888	8,192,422	13,045,189
Oficina	Mene Grande, Creole Pet.	1933	123	106	299	45,597	15,244,510	16,071,953	120,420,391
Yopales	Creole Pet.	1937	10	2	12	2,772	673,255	569,687	1,522,150
Pelayo	Venezuelan Atlantic Ref. Co.	1947	3	....	3	219	18,084	59,842	77,926
Caico Seco	Mene Grande Oil Company	1946	2	....	2	240	126,172	212,339	338,511
El Roble	Creole Pet.	1939	18	....	18	5,705	1,512,468	1,834,753	14,800,853
Guario	Socony-Vacuum	1940	21	....	21	6,177	2,351,169	2,347,005	9,195,533
Rincón	Texas Pet.	1941	4	....	4	1,822	795,605	696,688	3,118,028
San Joaquin	Mene Grande	1939	36	....	36	9,907	3,870,947	3,853,246	24,240,557
Santa Ana		1936	4	....	4	1,815	238,523	391,670	1,615,561
Santa Rosa		1941	6	....	6	1,944	974,717	1,013,960	4,740,682
Tocó		1948	3	....	3	1,412	.....	373,844	373,844
La Ceiba		1946	1	....	1	.....	53,106	73,660	176,004
Quiamare		1943	1	....	1	.....	79,057	32,595	642,453
Guarico									
Guavinita	S. A. Petrolera Las Mercedes	1948	4	....	4	318	.....	11,757	11,757
Las Mercedes		1943	70	....	70	9,000	61,554	1,946,468	2,098,390
Palacio		1947	33	....	33	4,755	.....	586,298	586,298
Sabán	Venezuelan Atlantic Ref. Co.	1948	1	....	1	353	.....	25,851	25,851
Tucupido		1945	17	....	17	10,000	1,736	1,021,846	1,030,178
Monagas									
Jusepín	Creole Pet.	1938	339	5	344	43,046	18,162,801	17,564,579	109,789,380
Mata Grande	Phillips Petroleum	1946	14	....	14	1,860	135,204	653,675	807,773
Mulata	Creole Pet.	1941	169	26	195	13,474	9,230,372	5,330,851	42,744,821
Muri	Cía. Consolidada de Pet.	1942	38	17	55	2,964	1,540,369	1,134,900	10,264,786
Pirital	Venezuelan Atlantic Ref. Co.	1944	1	....	1	16	13,969	8,756	79,171
Santa Bárbara	Consolidada, Mene Grande	1941	99	24	123	13,890	6,084,430	5,473,124	38,467,759
Travieso	Mene Grande	1944	68	8	76	5,402	4,621,407	2,854,362	37,782,943
Travieso 2		1944	1	8	9	362	281,584	151,601	732,196
Capacho	Creole Pet.	1945	....	....	....	.....	.....	.....	7,032
Caritos	Texas Pet.	1939	....	....	....	.....	75,863	8,221	344,829
Guanaco		1914	....	....	....	.....	.....	.....	1,855,805
Orocual	Creole Pet.	1933	....	....	....	.....	.....	.....	16,706
Quiriquire		1928	99	264	363	36,803	19,936,009	24,592,734	302,872,391
Temblador	Creole Pet., Mene Grande	1936	83	....	83	10,243	2,389,610	3,360,163	28,164,618
Territorio Delta Amacuro									
Pedernales	Creole Pet.	1935	2	....	2	3,022	441,681	956,024	10,433,719
Tucupita	Texas Pet.	1945	34	....	34	8,384	1,501,489	2,186,488	4,104,911
Eastern Totals		....	1,598	506	2,104	371,145	130,333,997	140,298,146	945,650,550
WESTERN VENEZUELA:									
Falcón									
Cumarebo	Creole Pet.	....	25	13	38	4,286	1,858,749	1,698,696	39,727,428
El Mene	British Controlled Oilfields Ltd.	1921	....	22	22	360	164,580	143,985	23,806,397
Hombre Pintado		1929	3	24	27	874	257,619	262,423	4,400,121
Media		1928	....	....	....	.....	Shut In	Shut In	1,699,532
Mene de Acosta	Tocuyo Oilfields, Ltd., North Venezuelan Pet.	1927	....	....	....	.....	Shut In	Shut In	851,817
Las Palmas	Creole Pet.	1929	....	....	....	.....	Shut In	Shut In	375,272
Urumaco	Richmond Exploration Co.	....	....	....	....	.....	Shut In	Shut In	205,072
Zulia									
Bachaquero	Creole Pet., Mene Grande, Venezuelan Oil Concessions, Ltd.	1938	426	43	469	120,838	32,034,764	40,585,710	126,112,990
Cabimas		1917	126	755	881	77,027	30,426,974	30,018,982	591,157,518
Lagunillas		1926	234	1,095	1,329	346,978	115,673,327	126,076,540	1,650,410,122
Pueblo Viejo		1940	19	4	23	8,597	2,252,394	3,135,451	9,851,841
Tia Juana		1928	135	453	588	138,781	65,708,295	66,331,576	559,969,253
El Menito	Mene Grande	1924	....	....	....	.....	.....	6,670	6,408
Mene Grande	Shell Caribbean Pet. Corp.	1913	5	273	278	45,329	13,909,854	16,338,415	324,416,723
Amana	Guasare Oil	1943	....	....	....	.....	1,799	.....	12,275
Boscán-Albaricos	Richmond Exploration Co.	1947	5	....	5	1,958	.....	271,800	271,800
Ensenada		1948	....	....	....	.....	.....	761	761
La Concepción	Venezuelan Oil Concessions, Ltd.	1925	4	75	79	4,080	1,050,824	1,148,862	32,282,863
La Paz		1922	19	24	43	121,196	27,404,114	43,691,926	105,713,241
Mara	Shell Caribbean Pet., Creole, Mene Grande, Texas Pet.	1945	14	....	14	63,284	9,052,828	15,611,299	29,183,636
Netick	Orinoco Oil Co.	1943	1	1	2	191	92,651	104,744	606,086
San José	Richmond Exploration Co.	1948	1	....	1	.....	.....	7,435	7,435
Sibucara	Shell Group	1948	1	....	1	4,496	.....	94,548	94,548
El Cubo, Las Cruces	Colón Development Co.	....	9	97	106	9,403	3,262,465	2,595,756	67,990,976
Los Manueles		1927	13	9	22	2,516	1,399,948	1,049,927	40,036,815
Río de Oro		1916	....	....	....	.....	Shut In	Shut In	3,873
Río Palamar (Totumo)	Creole Pet.	1915	....	....	....	.....	Abandoned	.....	141,636
W. Tarra	Colón Development	1927	3	....	3	1,478	*	511,896	814,158
Western Totals		....	1,043	2,888	3,931	951,672	304,551,185	349,686,717	3,610,150,597
TOTAL VENEZUELA		....	2,641	3,394	6,035	1,322,817	434,885,182	489,984,863	4,555,801,147

*Included with El Cubo, Las Cruces.

VENEZUELA—Eastern Fields

(See Eastern Continuation of this Map on Page 151)



VENEZUELA—Continued

year-end yields were reduced substantially during a late November revolution resulting in a change of Government. By the time order was reestablished it was apparent that weakening of the world market for heavy fuels would cause cutbacks in heavy crude from the Lake Maracaibo fields of Western Venezuela and the Quiriquire field of Eastern Venezuela. Production at the end of the year was 1,322,817 barrels a day, somewhat less than the yearly average, but still higher than at the beginning of the year.

Early in 1949 the heavy-crude fields were cut sharply, and it was estimated that such reductions would amount to 12 to 15 percent of the 1948 yearly average for part of the year, although it was expected that some of the cut would be restored toward the latter part of 1949.

The greater portion of the nation's output is from Western Venezuela, with the Cretaceous limestone fields west of Lake Maracaibo taking an ever-increasing part in the supply picture. At the end of the year these fields were yielding light oil at a rate of 186,000 barrels a day. Most of the remainder of the 950,000 barrels daily from Western Venezuela was heavy oil from the Bolivar Coastal fields along the west side of the lake. A feature of 1948 was the opening of a new

Drilling in Venezuela

STATE AND FIELD	WELLS COMPLETED IN 1947					WELLS COMPLETED IN 1948					WELLS DRILLING AND SHUT DOWN AT END OF 1948		
				Total					Total				
	Oil	Gas	Dry	Wells	Footage	Oil	Gas	Dry	Wells	Footage	Drlg.	SD	Total
EASTERN VENEZUELA:													
Anzoategui													
Chimire	..	..	..	..	.....	4	1	..	5	39,743	2	..	2
Fria	..	..	..	..	.....	7	..	..	7	43,300	1	..	1
Guara	30	..	4	34	229,780	29	..	2	31	210,542	..	..	..
Guico	12	..	..	12	74,340	8	..	1	9	65,812	..	..	..
Inca	..	..	..	..	.....	1	..	..	1	7,150	..	..	..
Leona	1	..	..	1	6,970	8	..	..	8	64,368	1	..	1
Nipa	17	..	..	17	127,500	37	..	..	37	314,858	11	..	11
Oficiana	13	1	3	17	112,090	14	..	1	15	93,504	2	..	2
Socororo	..	..	..	..	.....	1	..	1	2	8,282	..	..	..
Yopales	..	..	..	..	.....	6	..	..	6	27,888	2	..	2
Pelayo	2	..	..	2	13,360	2	..	1	3	23,601	1	..	1
Caico Seco	1	..	..	1	6,680	..	1	..	1	7,576	..	..	..
El Roble	4	..	..	4	41,117	3	..	..	3	31,063	3	..	3
Guario	5	..	..	5	36,910	5	..	..	5	28,171	2	..	2
Rincón	..	..	..	..	.....	..	..	..	..	.....	1	..	1
San Joaquín	7	..	..	7	39,900	5	..	..	5	30,474	3	..	3
Santa Ana	1	..	..	1	6,742	2	..	..	2	17,076	1	..	1
Santa Rosa	2	..	..	2	14,248	2	..	..	2	17,611	3	..	3
Tocó	..	..	..	..	.....	3	1	..	4	31,274	2	..	2
La Ceiba	1	..	..	1	8,520	..	..	..	..	.....	..	..	..
Wildcats	5	..	7	12	98,470	..	..	2	2	17,265	2	..	2
Guarico													
Guavinita	..	..	..	..	.....	6	..	..	6	22,674	1	..	1
Las Mercedes	39	4	6	49	216,717	33	..	6	39	167,239	3	..	3
Palacio	..	..	..	..	.....	23	..	4	27	94,510	1	..	1
Sabán	..	..	..	..	.....	6	2	12	20	42,818	1	..	1
Tucupido	..	..	..	..	.....	15	1	..	16	89,806	3	..	3
Wildcats	2	..	15	17	115,500	3	..	22	25	133,301	5	..	5
Monagas													
Jusepin	42	..	3	45	254,540	6	..	2	8	37,326	2	..	2
Mata Grande	12	1	3	16	72,812	7	..	3	10	52,090	1	..	1
Mulata	37	2	3	42	233,520	9	..	1	10	59,650	5	..	5
Santa Bárbara	25	..	7	32	204,159	10	..	..	10	59,698	6	..	6
Travieso	..	..	..	..	.....	3	..	2	5	28,703	1	..	1
Travieso 2	1	..	..	1	5,670	..	..	..	..	.....	..	..	..
Quiriquire	46	..	..	46	203,690	66	..	5	71	297,776	6	..	6
Temblador	5	..	1	6	22,260	14	..	4	18	73,301	3	..	3
Wildcats	..	..	16	16	132,840	4	1	9	14	94,610	11	..	11
Territorio Delta Amacuro													
Pedernales	..	..	..	..	.....	..	..	..	..	.....	1	..	1
Tucupita	14	..	..	14	83,240	18	..	..	18	102,048	2	..	2
Total Eastern	324	8	68	400	2,361,575	360	7	78	445	2,435,108	89	..	89
WESTERN VENEZUELA:													
Barinas													
Silvestre	..	..	..	..	.....	2	..	..	2	19,649	1	..	1
Wildcats	1	..	..	1	8,650	..	..	..	..	.....	..	..	..
Falcón													
Cumarebo	3	..	..	3	12,270	..	..	..	..	.....	..	..	..
Hombre Pintado	..	..	..	..	.....	3	..	..	3	4,444	1	..	1
Zulia													
Bachaquero	174	1	1	176	651,200	184	..	2	186	810,068	10	..	10
Cabimas	5	..	1	6	31,116	5	..	..	5	14,886	..	..	..
Lagunillas	50	..	1	51	288,150	60	..	..	60	251,905	6	..	6
Pueblo Viejo	9	..	2	11	35,475	2	..	..	2	7,736	1	..	1
Tia Juana	76	..	1	77	368,848	120	..	..	120	312,129	9	..	9
Mene Grande	32	..	5	37	231,100	19	..	..	19	90,200	2	..	2
Boscán-Albaricos	..	..	..	..	.....	20	..	..	20	141,512	6	..	6
La Concepción	..	..	..	..	.....	1	..	..	1	12,085	..	..	..
La Paz	3	..	..	3	19,532	5	..	..	5	45,087	4	..	4
Mara	4	..	..	4	29,105	9	..	1	10	93,383	9	..	9
Netiek	..	..	..	..	.....	..	..	1	1	10,156	..	..	..
El Cubo, Las Cruces, Tarra	7	..	1	8	19,245	..	..	..	..	.....	..	..	..
W. Tarra	..	..	..	..	.....	1	..	..	1	9,614	2	..	2
Wildcats	1	..	9	10	86,815	2	..	7	9	91,146	12	..	12
Total Western	365	1	21	387	1,781,506	433	..	11	444	1,914,000	63	..	63
TOTAL VENEZUELA	689	9	89	787	4,143,081	793	7	89	889	4,349,108	152	..	152

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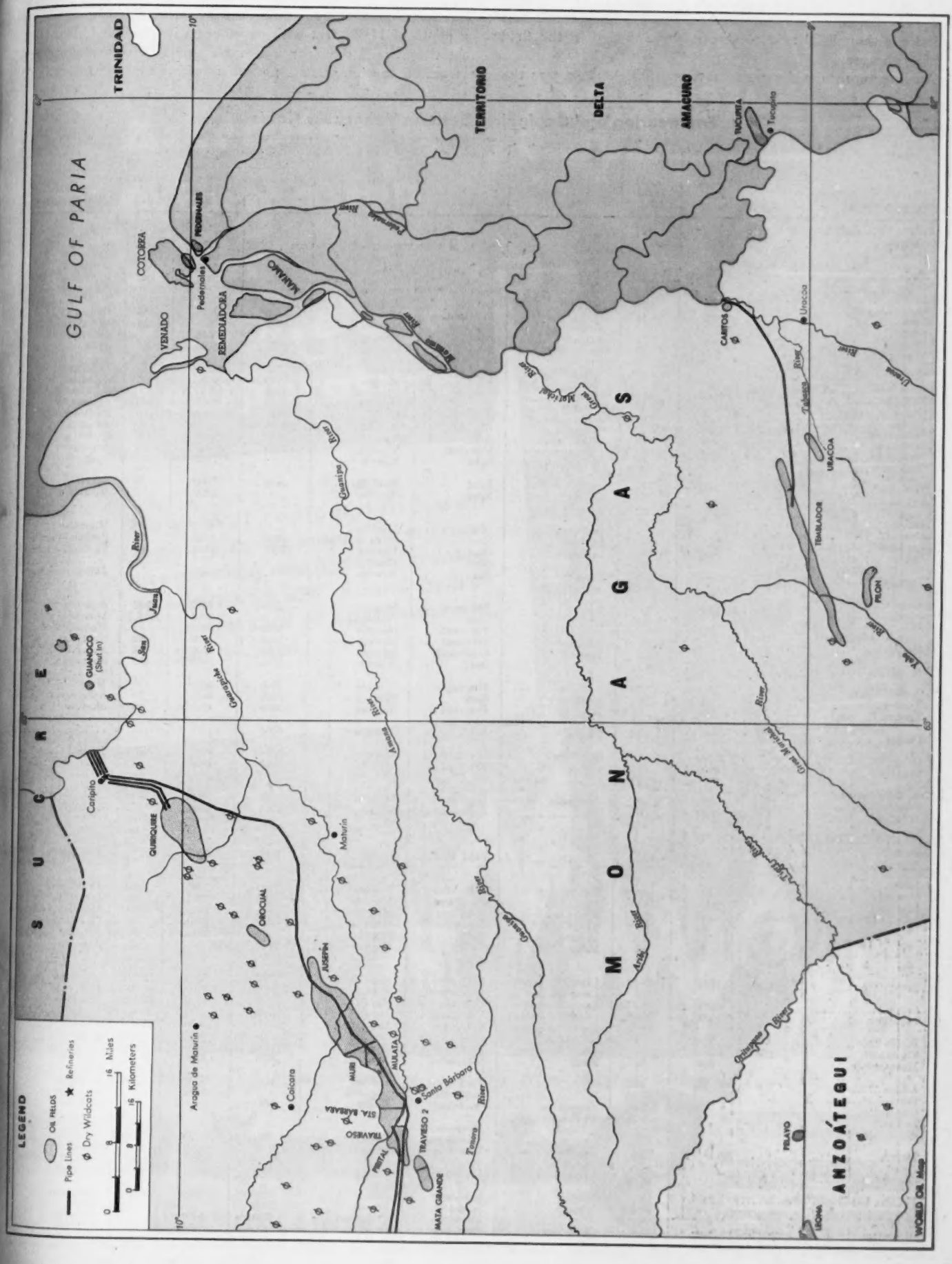
VENEZUELA—Eastern Fields

(See Western Continuation of this Map on Page 146)



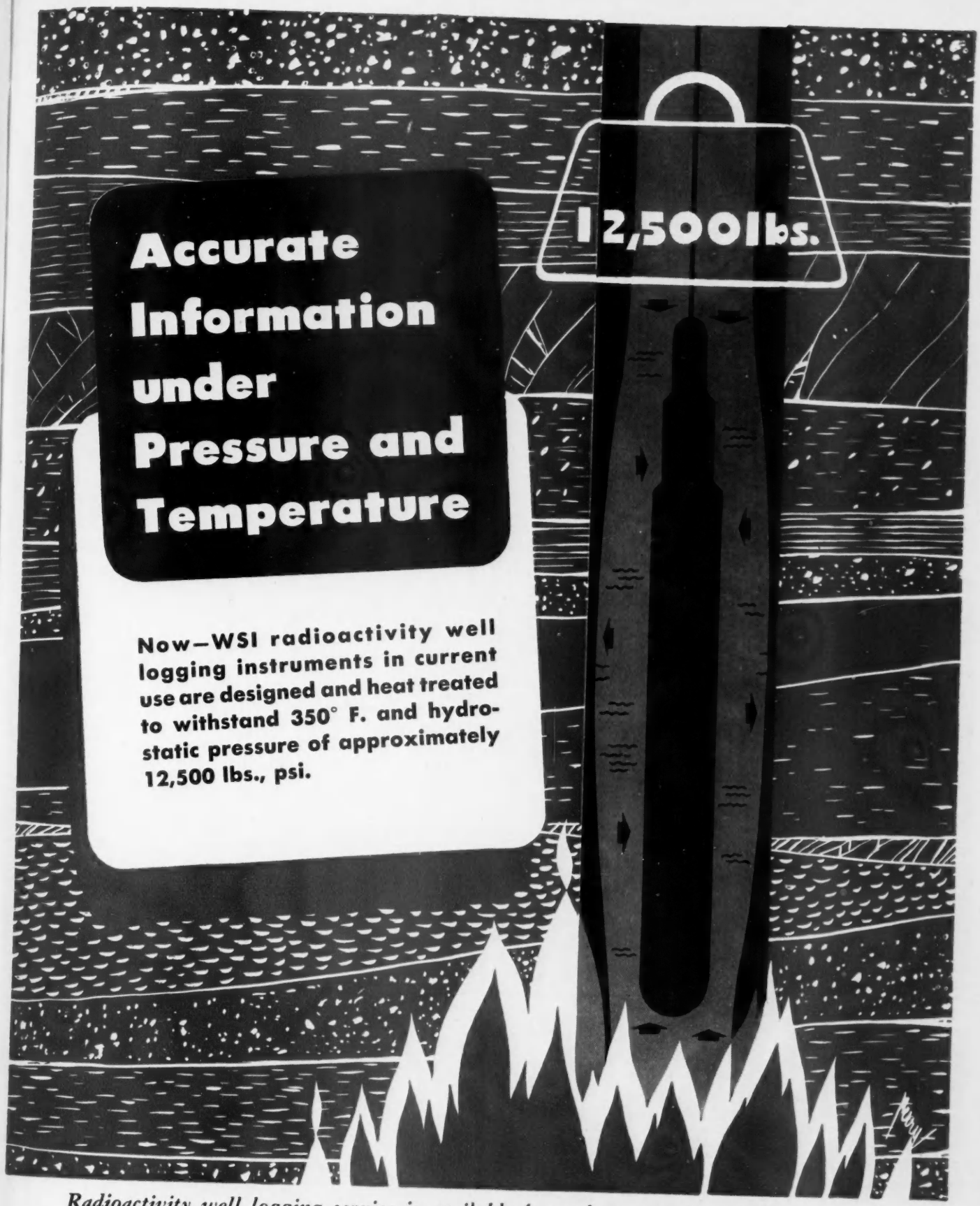
VENEZUELA—Continued

heavy oil field by Richmond Exploration Company 25 miles west of Lake Maracaibo, and construction of a new 18-inch pipe line and marine terminal. The year-end drop in demand for heavy oils is keeping this field restricted to a small offtake, although 20 new producers were drilled in the field during the year.

An interesting development in Western Venezuela was the discovery by the Shell Group of a new field at Sibucara, just west of the city of Maracaibo. The discovery well, completed just after the first of 1949, gives Venezuela its deepest production. The well was completed in Cretaceous Limestone at a depth of 13,451 feet with pay topped just below 12,000 feet. At the end of the year a 12-inch pipe line was under construction to connect the new well with Palmarejo terminal,

Engineering and Geological Data on Venezuela Fields

STATE AND FIELD	Proven Area (Acres)	Gravity of Oil A.P.I.	Name	Kind	Age	DEPTH (Feet) Minimum Top of Pay	DEPTH (Feet) Maximum to Bottom of Pay	Avge. Thickness of Pay	Type Structure
EASTERN VENEZUELA:									
Anzoategui:									
Caris	....	....	Oficina	Sand	Mio-Olig.	....	8301	....	Anticline
Chimire	....	....	Oficina	Sand	Miocene	....	6900	....	Fault
Guara	3350	15-37	Guara	Fine sand	Miocene	5200	6560	45	Monocline
Guico	2650	38	Oficina	Fine sand	Miocene	5200	7000	40	Monocline
Inca	....	27	Oficina	Sand	Miocene	....	7150	....	Fault
Leona	1100	26	Leona	Lutitas	Miocene	6000	7000	26	Fault
Nipa	1050	33-38	Oficina	Fine sand	Miocene	7100	7600	50	Faulted anticline
Oficina	13500	25	Oficina	Fine sand	Miocene	4590	5900	20	Monocline
Pelayo	250	30.2	Oficina	Sand	Miocene	7480	8005	....	Anticline
Yopales	900	16-42	Oficina	Sand	Miocene	4340	5900	....	Fault
B-1	....	40	Oficina	Sand	Miocene	7740	8500	165	Anticline
Caico Seco	200	....	Oficina	Sand	Miocene	7140	8500	25	Anticline
El Roble	9100	44	Roble	Sand	Oligocene	7800	10500	....	Anticline
Guario	4000	38-45	Oficina	Sand	Mio-Olig.	4200	8000	350	Anticline
Rincón	300	42	Oficina	Sand	Miocene	7730	9000	60	Faulted anticline
San Joaquín	7692	43	S. Joaquin	Clay sand	Mio-Olig.	6230	6560	50	Anticline
Santa Ana	250	34.6	Oficina	Sand	Mio-Olig.-Eoc.	4500	8840	180	Faulted anticline
Santa Rosa	1670	42	S. Rosa	Fine sand	Mio-Olig.	7546	10400	20	Anticline
Tocó	....	....	Oficina	Sand	Miocene	....	7950	....	Fault
La Ceiba	150	37.3	.....	Sand	Mio-Olig.	5400	7000	20	Anticline
Quiamare	50	39	.....	Sand	Pliocene	....	6400	....	Monocline
Guarico:									
Guavinita	....	....	La Pascua	Sand	Mio-Olig.	....	4001	....	Monocline
Las Mercedes-Grico	7000	32	La Pascua	Sand	Mio.-Olig.-Cret.	4200	6400	25	Faulted Monocline
Palacio	1000	34	La Pascua	Sand	Miocene	3500	4500	....	Faulted Monocline
Sabán	....	36	.....	Sand	Mio-Olig.	....	5718	....	.....
Tucupido	500	36	Tucupido	Sand	Miocene	....	6858	....	Anticline
Monagas:									
Jusepín	17000	33	Jusepín	Fine sand	Miocene	4590	4670	82	Anticline
JX6	....	12.6	.....	Lime	Cretaceous	....	2546	....	Monocline
Mata Grande (Filven)	300	25	.....	Fine sand	Miocene	5700	6100	35	Monocline
Mulata	7240	33	Mulata	Fine sand	Miocene	5240	5900	62	Strat.-trap
Muri	800	32	Muri	Loose sand	Miocene	3280	3600	43	Monocline
Piritál	50	28	.....	Sand	Miocene	5870	5925	80	Strat.-trap.
Santa Bárbara	2315	27-30	S. Bárbara	Fine sand	Miocene	5900	6560	125	Monocline
Travieso	2500	33	La Pica	Sand	Miocene	5500	6450	75	Anticline
Travieso 2	500	31	.....	Fine sand	Miocene	5600	6200	40	Monocline
Caritos	200	30.5	Oficina	Sand	Miocene	5650	....	....	.....
Quiriquire	12250	19	Quiriquire	Clay sand	Pliocene	2624	4900	157	Faulted Monocline
Temblador	4600	21	Oficina	Fine sand	Miocene	3600	3930	43	Fault
Terr. Delta Amacuro:									
Pedernales	972	21	Pedernales	Loose sand	Miocene	1550	2500	248	Anticline
Tucupita	600	16.5	.....	Loose sand	Miocene	5550	6000	35	Anticline
WESTERN VENEZUELA:									
Barinas:									
Silvestre	....	26	.....	Sand	Eocene	8600	9763	....	Anticline
Falcón:									
Cumarebo	540	48	Socorro	Lent. sand	Miocene	1950	3000	30	Anticline
El Mene	1008	33	Agua Clara	Sandstone	Miocene	1120	1600	50	Anticline
Hombre Pintado	92	24	Agua Clara	Sandstone	Miocene	2460	2630	60	Anticline
Media	62	34	Agua Clara	Sandstone	Miocene	3280	3900	50	Fault
Mene de Acosta	....	....	El Salto	Sand	Oligocene	970	2046	30	Anticline
Las Palmas	50	34	Monte Claro	Sand	Oligocene	2750	....	55	Anticline
Zulia:									
Bachaquero	19000	13-17	Lagunillas Icotea	Clay, sand	Mio-Olig.	2800	6000	13-110	Monocline
		14	Lagunillas Icotea	Clay, sand	Mio-Olig.	2800	6000	98-215	Monocline
Cabimas	4500	15-27	Lagunillas Icotea	Clay, sand	Mio-Olig.	1600	3600	15-100	Monocline
Lagunillas	60000	16-30	Lagunillas Icotea	Clay, sand	Mio-Olig.	2500	5500	66	Monocline
		11-18	Lagunillas Icotea	Clay, sand	Mio-Olig.	2500	5500	14-144	Monocline
Pueblo Viejo	3750	21	.....	Sand	Eocene	1850	3000	75	Anticline
Tía Juana	43000	13	Lagunillas	Clay, sand	Miocene	2850	5000	164	Monocline
Mene Grande	8645	22	Pauji	Clay, sand	Miocene	3050	4550	60-540	Anticline
Amana	500	31.5	.....	Sand	Eocene	3188	4500	40	Anticline
Boscán	....	10-12	.....	Sandstone	Olig.-Eoc.	....	9982	....	Anticline
Concepción	2470	37	Concepción	Sandstone	Eocene	1700	....	410	Anticline
La Paz	1359	24-34	La Paz, La Luna, Cogollo	Sandstone, Limestone	Eoc.-Cret.	1900	2950	180	Anticline
Mara	1500	29.5	Cogollo	Limestone	Cretaceous	6400	7000	1500	Anticline
Netick	250	29.2	Harqueta	Sand	Eocene	5860	6097	....	Faulted anticline
Sibucara	....	36.6	Cogollo	Limestone	Cretaceous	12200	13451	....	Anticline
El Cubo, Las Cruces, Tarra	2470	19-33	Mirador	Sandstone	Eocene	2300	6350	65-213	Monocline
Las Manueles	420	30-39	Mirador	Sandstone	Eocene	3900	....	39	Dome
W. Tarra	500	41	.....	Limestone	Cretaceous	6900	8400	....	Anticline
Río de Oro	100	388	Río de Oro	Sand, lime	Cretaceous	....	1850	....	Faulted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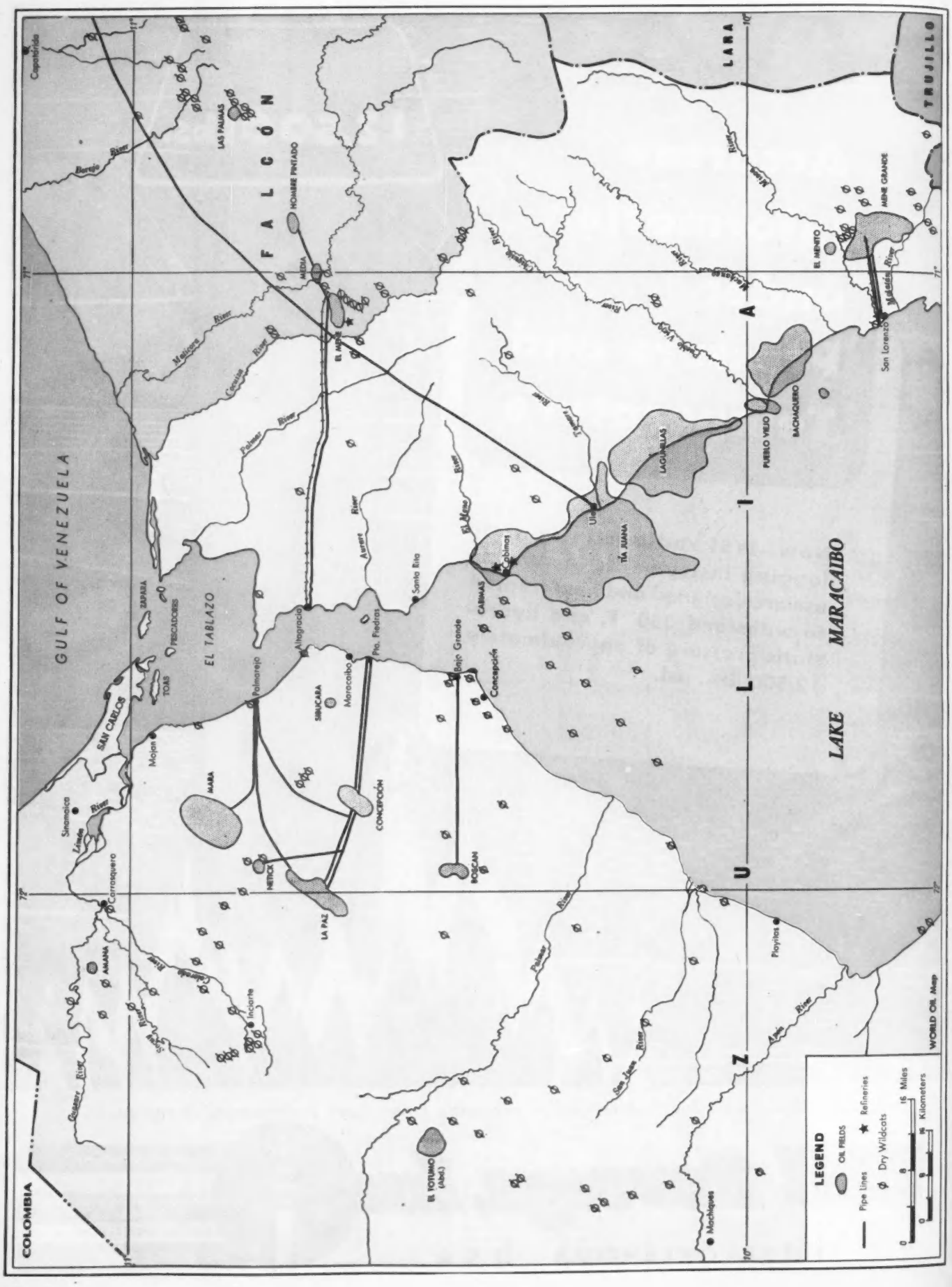
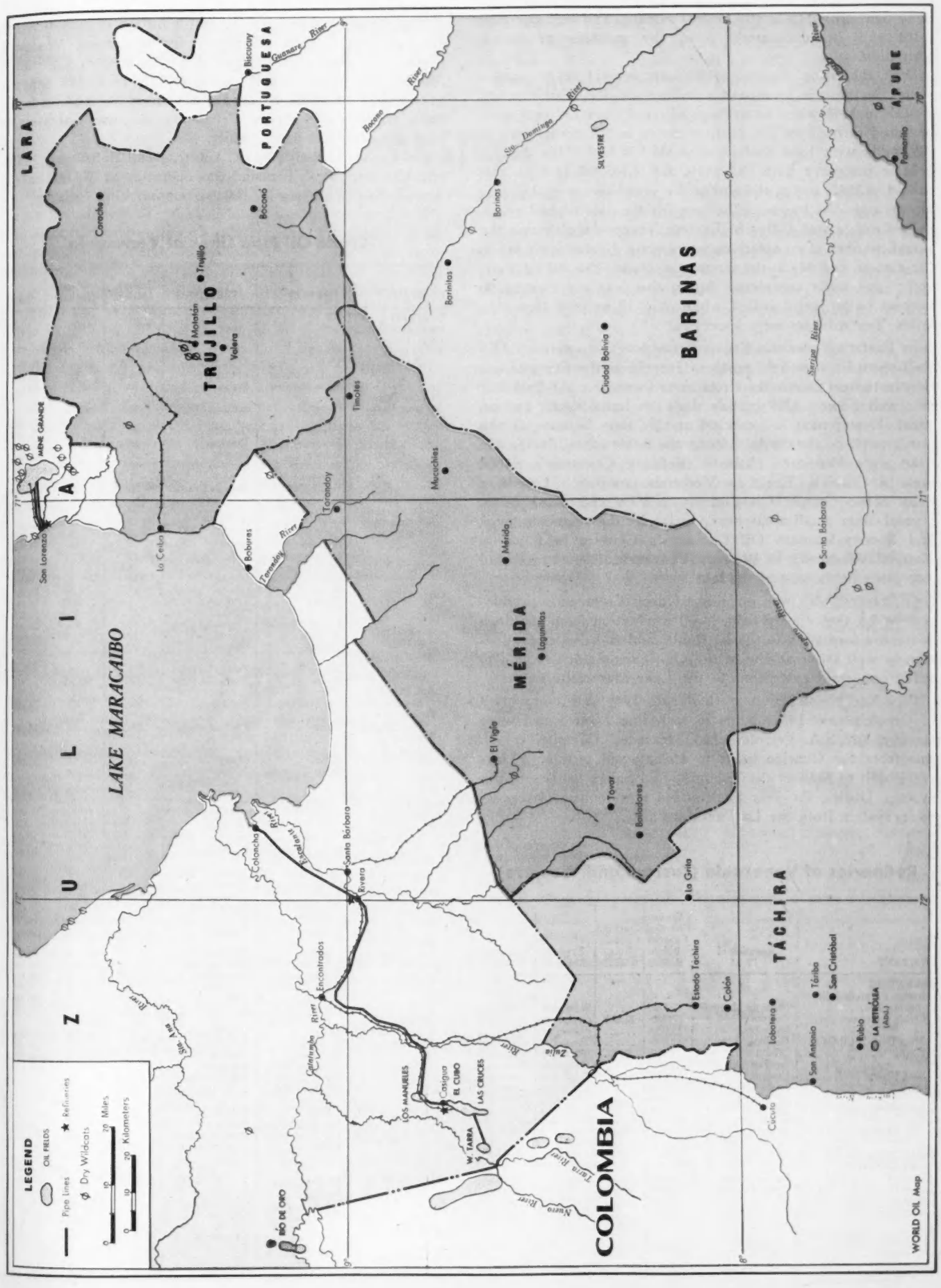
VENEZUELA—Northwestern Fields



VENEZUELA—Southwestern Fields



VENEZUELA—Continued

a little more than 9 miles to the north. The Cretaceous fields yield light oil which is still in firm demand, and high per-well rates can be maintained from the massive producing formation.

With the rising demand of the past several years came a steady increase in Venezuela's drilling activity. This reached a peak in 1948 when an average of more than 150 rigs were operated throughout the year, resulting in the completion of 889 wells with total footage of 4,349,108 feet. This drilling volume compares with 787 wells and 4,143,081 feet of hole drilled in 1947, and at the end of the year there were 152 rigs in operation. As has been the case for the past several years, more footage was drilled in Eastern Venezuela, although the actual number of completions was evenly divided with 445 in the eastern and 444 in the western districts. The 793 oil wells and 7 gas wells completed during the year represented 90 percent of all wells drilled while only 10 percent were dry holes. Ten wildcats were successful.

In Eastern Venezuela Creole Petroleum Corporation's JX6 well opened a new field north of Jusepín as the first production in the east from the Cretaceous formation. At 2546 feet this well flowed 3200 barrels daily on initial tests, but no great development is expected at this time because of the low gravity of the crude. Among the fields found during the year were Venezuela Atlantic Refining Company's Sabán area in Guarico, The Las Mercedes company's Guavinita field, Mene Grande Oil Company's Fria and Tocó fields, several other small areas near Oficina by the same company, and Socony-Vacuum Oil Company's Chimire field, all in Eastern Venezuela. In Western Venezuela, Richmond found two other fields west of the lake.

Of interest also was opening of deep Cretaceous production in La Concepción field, good production from the deep Merecure formation in the El Roble field and deeper production as well as expansion of the Quiriquire field. Creole also made important extensions to the Lake Maracaibo fields.

Pipe line construction work during 1948 saw completion of Creole's new 145-mile 24-26 inch line from Río Ule to Amuay, and S.A. Petrolera Las Mercedes' 157-mile 16-inch line from the Guarico fields to Pamatacuál terminal. Lines were built to connect the Tucupido and Sabán fields into this system. During the year Shell added new loops and feeders to its system from the La Paz-Mara area.

Refineries of Venezuela (Eastern and Western)

COMPANY	Location of Plant	Crude Charging Capacity (Bbls.) Daily)	Cracking Capacity (Bbls.) Daily)	Type of Refinery	Operating Status
OPERATING					
British Controlled Oilfields, Ltd.	Mene de Mauroa	250	.....	Skimming	Operating
Creole Petroleum Corp.	Caripto	70,000	35,000	Complete	Operating
	La Salina	12,000	.....	Skimming	Operating
Mene Grande Oil Co.	Cabimas	1,800	.....	Skimming	Operating
	Oficina	930	.....	Skimming	Operating
	San Lorenzo	41,000	.....	Skimming	Operating
Shell Group	Casigua	700	.....	Skimming	Operating
	La Rivera	200	.....	Skimming	Operating
	El Calvario	200	.....	Skimming	Operating
Socony-Vacuum Oil Co.	Guario	120	.....	Skimming	Operating
Total	10 Plants	127,200	35,000		
BUILDING AND PLANNED					
Creole Pet. Corp.	Bay of Amuay	60,000	*7,000	Complete	Building
Shell Group	Punta Cardón	40,000	40,000	Complete	Building
Sinclair Oil Co.	Puerto la Cruz	35,000	.....	Complete	Planned
Venezuela Gulf Ref. Co.	Puerto la Cruz	30,000	.....	Complete	Building
Total Planned and Building	4 Plants	160,000	47,000		

* Hydroforming capacity.

Netherlands West Indies Refineries

The refining capacity of the plants on the islands of Aruba and Curaçao is used principally for processing Venezuela crudes. On Aruba the Lago Oil and Transport Company's 360,000-barrel plant was running slightly less than capacity at the end of the year because of decreased demand for heavy fuels, while Shell's Arend Petroleum Mij. was operating at capacity of 35,000 barrels daily.

On Curacao, Shell's N. V. Curaçaosche Petroleum Industrie Mij. plant at Willemstad was operating at 275,000 barrels a day. This plant has 100,000 barrels cracking capacity.

Crude Oil Pipe Lines of Venezuela

COMPANY	ORIGIN	TERMINUS	Length (Miles)	Diam. (Inches)	Status
EASTERN VENEZUELA:					
Cía. Consolidada de Petróleo	Muri	Santa Bárbara	7.5	8"	In use
	Santa Bárbara	El Chaure	95.6	12"	In use
	Santa Bárbara	Mulata	10	8"	In use
Creole Petroleum Corp.	Caripito	San Juan Term.	14	8", 10, 14, 16	In use
	Jusepín	Caripito	46	16	In use
	Jusepín	Travieso	16	16	In use
	Mulata	Jusepín	10	10	In use
	Quiriquire	Caripito	17	8	In use
	Quiriquire	Caripito	17	10	In use
	Temblador	Boca de Uracoa	30	10	In use
Mene Grande Oil Co. and Creole Pet. Corp.	Caico Seco	Anaco	33.4	6	In use
	El Roble	Anaco	5	6	In use
	Santa Ana	Anaco	17	6, 8	In use
	Santa Rosa	Anaco	4.5	6	In use
	Leona	Oficina	18	6	In use
	Moquete	Oficina	10	4, 6	In use
	Mulata	Travieso 3	7.5	10	In use
	Nipa	Oficina	17	10	In use
	Travieso 3	Puerto La Cruz	95.4	16	In use
	W. Guara	Oficina	12	6, 8	In use
	Yopales	Oficina	10	4	In use
Mene Grande Oil Co.	Oficina	Puerto La Cruz	104	16	In use
	Anaco	Puerto La Cruz	65	16" loop	In use
S.A. Petrolera Las Mercedes	Las Mercedes	Pamatacuál	157	16	In use
Socony-Vacuum Oil Company	Guico	Puerto La Cruz	103	16	In use
Venezuelan Atlantic Refining Co.	Pelayo	Leona	12	6	In use
	Sabán-Tucupido	Junction with Las Mercedes line	27	8	In use
WESTERN VENEZUELA:					
British Controlled Oilfields, Ltd.	Mene de Mauroa	La Estacado	32	6	In use
Creole Petroleum Corp.	Las Palmas	Hombre Pintado	4.4	4	In use
	Cabimas	(Field Lines)	4.5	10, 16	In use
	Río Ule	Amuay Bay	145	24. 26	In use
	Tía Juana	(Field Lines)	9	10	In use
	Cumarebo	Terminal	2.5	6	In use
	Cumarebo	Terminal	2.5	6	In use
Mene Grande Oil Company	Ambrosio	Cabimas	2.5	6	In use
	Lagunillas	(Field Lines)	6.2	6, 10	In use
	Pueblo Viejo	Lagunillas	11.4	8	In use
	Punta Benitez	Cabimas	5	8	In use
	Taparito	Cabimas	11.3	12	In use
Orinoco Oil Co.	Netick	La Paz	8.7	3, 4	In use
Richmond Exploration Co.	Boscán	Bajo Grande	25	18	In use
Shell Group	Casiqua	La Solita	85	8	In use
	Las Cruces	Casigua	7.5	6	In use
	Catía La Mar	Boquerón	3.5	4	In use
	Mene Grande	San Lorenzo	2—9.3	12	In use
	Cuatro Bocas	Palmarejo	12.5	10 (with 12" loop)	In use
	Cuatro Bocas	Palmarejo	12.5	12	In use
	La Concepción	Palmarejo	17	12	In use
	La Concepción	Punta Piedras	16	6	In use
	La Paz	Cuatro Bocas	13.7	8, 10, 12, (with 10" loops)	In use
	La Paz	La Concepción	11	6	In use
	La Paz	La Concepción	11	10, 11	In use
	Mara	Cuatro Bocas	8	12	In use
	Mara	Jnct. w/Shell Line	5	10	In use
	Sibucara	Palmarejo	9.4	12	Building
Total			1,449.1		

ALBANIA

ALBANIA, which has been an oil producing nation since 1933, has never been a really substantial producer, although during 1942 its total yield reached a high of 1,601,000 barrels. Since that time it dropped off sharply due to the lack of new reservoirs which would withstand the wartime drain. In an effort to stimulate development the oil industry has been nationalized, but thus far there has been no apparent increase. The Devoli fields, and other small fields at Pahtoso, have failed to respond and production during 1948 amounted to only 358,000 barrels of oil, which comes from Miocene formations at depths between 1640 and 2620 feet. A 750-barrel refinery is located near the fields, but most products are imported.

AUSTRIA

FOLLOWING a year in which there were no important discoveries of new oil, the fields of Austria suffered a decline in output amounting to 14.5 percent as compared with 1947 production. Total production for the past year was 5,710,910 barrels, or 972,718 barrels less than was produced during 1947. The only substantial increase was indicated in the Mühlberg field where production rose from 1,550,000 barrels in 1947 to 1,819,510 barrels in 1948. This field, as are most of the producing areas, is operated by the Soviets, and is one of the few remaining areas whose development is not yet complete. It is estimated that some 20 to 30 locations remain to be drilled before the currently proved area is fully developed. Meanwhile concern is felt over its future prospects because of the Russian practice of flowing the wells at high rates in order to offset the decline in older fields, trying to maintain total Austrian production at as high a level as possible.

Of particular interest during the year was the further prospecting of the Matzen structure when the Soviets drilled a well that found good oil showings before it had to be junked. A subsequent well found high pressure gas in May of 1948, but blew out of control and cratered. Shortly after the beginning of 1949 a third well is reported as having been completed as a good producer, with every indication that the well may add an important producing area in the Lower Danube region.

Despite shortages of casing and other tubular goods, and the lack of new drilling equipment, 40 wells were drilled, including five wildcats drilled by the Russians in the eastern part of the country. Thirty drilling rigs are located in Austria, but all are old except for five fairly new outfits moved in by Soviet operators during the year. They have not been used to full efficiency due to material shortages.

Early in 1949 negotiations had been renewed between the Soviets and the Western Powers for recovery of prewar holdings.

Refineries of Austria

COMPANY	Location of Plant	Total Charging Capacity Barrels Daily	Type of Refinery	Operating Status
Soviet Zone				
*Aktiengesellschaft der Kohlenwertstoffverbaende Gruppe *Bezin-Benzol Verband (BV)*.	Vösendorf (Vienna)	2,500	Skim, lube, asphalt	Operating
Aktiengesellschaft de Shell-Floridsdorfer Mineralölfabrik (Shell)	Floridsdorf (Vienna)	2,800	Skim, lube, asphalt	Operating
*Donau Oel Gesellschaft m.b.H.	Moosbierbaum (near Tulln)	3,500	Skim, lube, asphalt	Operating
*Korneuburger Mineralölraffinerie Aktiengesellschaft	Korneuburg (Vienna)	5,600	Skim, lube,a sphalt	Operating
*"NOVA", Mineralölraffinerie Aktiengesellschaft	Schwechat (Vienna)	3,500	Skim, crack, lube, asphalt	Operating
*Oesterreichische Mineralölwerke Gesellschaft m.b.H (Shell-Socony-Vacuum)	Lobau (Vienna)	5,600	Skimming	Operating
Vacuum Oil Co., Aktiengesellschaft (Socony-Vacuum)	Karan (Vienna)	2,500	Skim, lube, asphalt	Operating
U. S. Zone				
Deutsche Erdölwerke	Ebensee (near Linz)	2,200	Skimming	Shut Down

* Soviet claimed and operated.

Oil Production and Producing Wells in Austria

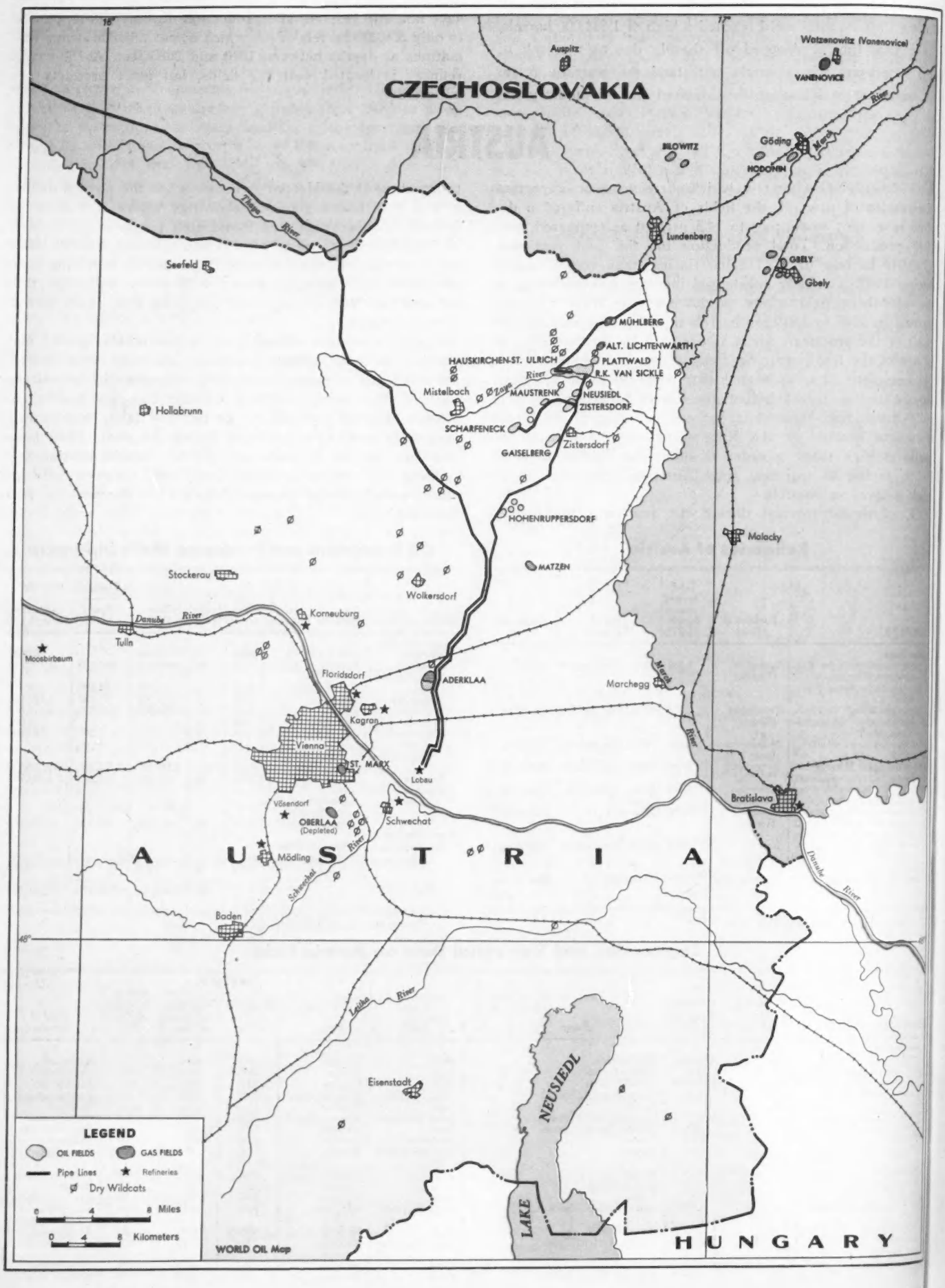
Region and Field	Operating Company	Year of Discovery	Producing Wells	Crude Oil Production (Barrels) Year 1947	Year 1948	Cumulative Through 1948
Lower Danube						
Aderklaa	S.M.O.A.*	1942	4	8,000	.....	22,000
Gaiselberg	Rohoelgew, A.G.	1938	60	956,000	1,047,160	11,104,160
Hohenruppersdorf	S.M.O.A.	1941	5	37,000	14,480	78,480
Maustrenk	S.M.O.A.	1941	44	165,000	76,390	1,142,390
Mühlberg	S.M.O.A.	1942	24	1,550,000	1,819,510	4,749,510
Neusiedl	S.M.O.A.	1936	4	.....	.....	153,000
Scharfeneck	S.M.O.A.	1944	2	.....	260	21,260
St. Ulrich-Hauskirchen	S.M.O.A. & R. V. Van Sickle	1938	351	2,755,000	1,531,250	19,135,250
Van Sickle	S.M.O.A.	1939	52	260,000	369,920	5,298,920
Zistersdorf (Rag & Gösting)	Rohoelgew. A. G. & Erdölproduktions G.m.b.H.	1930	91	952,028	851,340	11,235,004
Upper Danube						
Leoprechting	"Pram" Erdölexplorations G.m.b.H.	1906	10	600	600	2,600
Total	.....	.....	647	6,683,628	5,710,910	52,942,574

* Soviet Mineral Oil Administration.

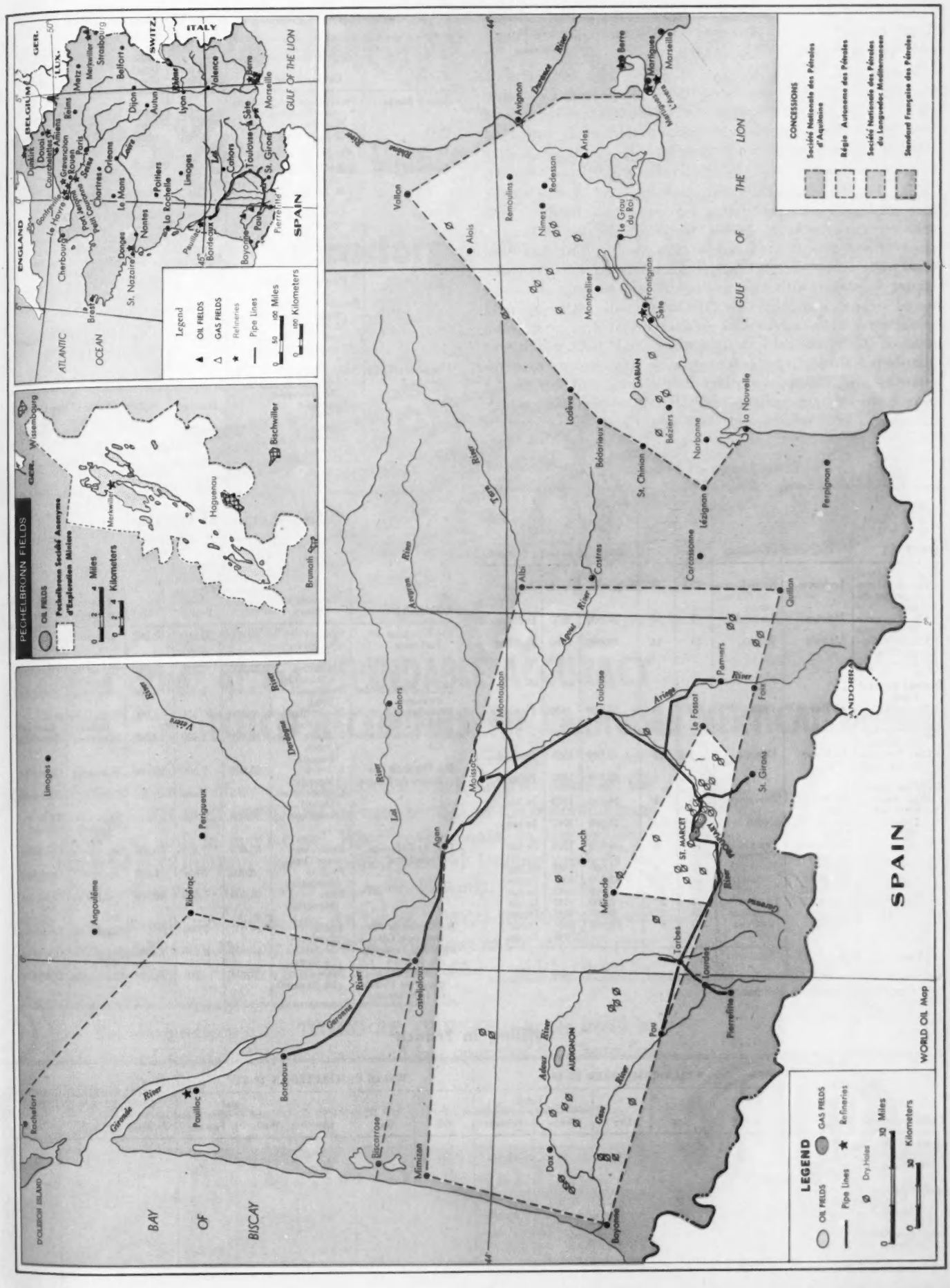
Engineering and Geological Data on Austria Fields

REGION AND FIELD	Proved Area (Acres)	Range of Gravity (A.P.I.)	Name	Kind	Age	DEPTH (Ft.) Minimum to Top of Pay	Maximum to Bottom of Pay	Average Thickness of Pay (Ft.)	Type of Structure
Lower Danube									
Aderklaa	.....	48.8-gas	Helvet-Schlier	Sand	Miocene	7977	8535	85	Buried hill
Alt.-Lichtenwarth	.....	Gas	Sarmat-Torton	Sand	Miocene	2886	3644	115	Fault structure
Gaiselberg	200	21.5-27.5	Sarmat-Torton	Sand	Miocene	2066	7724	387	Fault structure
Hohenruppersdorf	.....	35.0	Sarmat-Torton (Flysch)	Sand, Sandstone	Miocene (Cret.)	3323	5366	98	Fault structure
Matzen	.....	.....	Sarmat	Sand	Miocene	n. a.	n. a.	n. a.	Anticline
Maustrenk	200	26.5	Helvet-Schlier (Flysch)	Sand, Sandstone	Miocene (Eoc.)	2756	3297	164	Stratigr. trap
Mühlberg	....	30.5	Pannon, Sarmat-Torton	Sand	Miocene	1490	5315	476	Fault structure
Neusiedl	.....	31.5	Flysch	Sandstone	Eocene	4003	4101	20	Anticline
Oberlaa	.....	Gas	Torton	Sand-conglomerate	Miocene	820	873	13	Buried hill
Plattwald	.....	21.5	Torton	Sand	Miocene	3255	5190	56	Fault structure
Scharfeneck	.....	24.0	Helvet-Schlier	Sand	Miocene	3251	3317	66	Stratigr. trap
St. Marx	.....	Gas	Torton	Sand	Miocene	2343	2395	52	Fault anticline
St. Ulrich-Hauskirchen	2000	31.5	Helvet-Schlier (Flysch)	Sand, Sandstone	Mio., Eoc.	2723	3773	394	Buried hill and anticline
Van Sickle	.....	21.5-27.5	Sarmat-Torton	Sand	Miocene	1312	4593	459	Fault structure
Zistersdorf	100	20.7-27.5	Sarmat, Torton, Flysch	Sand, Sandstone	Miocene	2165	7720	518	Fault structure
Upper Danube									
Leoprechting	.....	12.9	Burdigal-Schlier	Sand	Miocene	394	472	33	Stratigr. trap
Wels	.....	Gas	Burdigal, Helvet-Schlier	Sand	Miocene	476	1499	33	Stratigr. trap

AUSTRIA and CZECHOSLOVAKIA—Vienna Basin Fields



FRANCE


PECHELBRONN FIELDS
Pechelbronn Société Anonyme d'Exploitation Minière
OIL FIELDS
Miles
Kilometers
Merkwiller
Haguenau
Bischwiller
Wissembourg
Brumath
Legend
OIL FIELDS
GAS FIELDS
Refineries
Pipe Lines
Miles
Kilometers
ENGLAND
BELGIUM
GER.
LUX.
SWITZ.
ITALY
SPAIN
ATLANTIC OCEAN
GULF OF THE LION
BAY OF BISCAY
Cherbourg
Le Havre
Rouen
Paris
Orleans
Le Mans
Nantes
St. Nazaire
Brest
Poitiers
La Rochelle
Limoges
Bordeaux
Cahors
Toulouse
St. Gironi
Pau
Pierrefitte
Bayonne
Biarritz
Dijon
Autun
Lyon
Belfort
Strasbourg
Metz
Reims
Lille
Dunkirk
Calais
Amiens
Dieppe
Chartres
Tours
Angers
Donges
Valence
Marseille
Nice
Avignon
Arles
Nimes
Montpellier
Sete
Frontignan
Le Grau du Roi
Remoulins
Redesson
Aleis
Volton
Barre
Martigues
CONCESSIONS
Société Nationale des Pétroles d'Aquitaine
Régie Autonome des Pétroles
Société Nationale des Pétroles du Languedoc Méditerranéen
Standard Française des Pétroles
Limoges
Angoulême
Périgueux
Ribérac
Rochefort
Pauillac
Bordeaux
Biscarrosse
Mimizan
Castelsarrasin
Agen
Cahors
Montauban
Auch
Mirande
Tarbes
Lourdes
Dax
Bayonne
St. Girons
Foix
Pamiers
Le Fossat
St. Marcet
Quillan
Perpignan
Carcassonne
Lézignan
Narbonne
La Nouvelle
Béziers
St. Chinian
Bédarieux
Lodève
Castres
Albi
Gabian
Garonne River
Dordogne River
Lot River
Tarn River
Aveyron River
Ariège River
Adour River
Gave River
Rhône River
Durance River
Canal du Midi
ANDORRA
D'OLERON ISLAND
AUDIGNON
LEGEND
OIL FIELDS
GAS FIELDS
Pipe Lines
Refineries
Dry Holes
Miles
Kilometers
WORLD OIL Map

FRANCE—Continued

representing an increase of 62 percent in the footage drilled. Total footage for the year was 234,850 feet compared with 144,540 feet drilled in 1947.

French operators now have 18 heavy rigs in operation capable of drilling to depths of 10,000-12,000 feet. Two other rigs are capable of drilling in the 5,000-8,000-foot range, and in addition there are 31 light portable and other rigs used largely for core holes and structure drilling. Twelve of the 63 completions were wells which went to 8,000 feet or deeper.

The Pechelbronn field maintained its level of production through drilling 10 additional oil wells but although this area accounts for most of the crude oil production of France, most of the attention to deep exploration drilling has concentrated in southern France, particularly in the Aquitaine Basin. However, although geological and geophysical work found many prospects in this region, St. Marcet field remains the only commercial producer. This field produced a total of 6.2 billion cubic feet of gas during 1948, which was distributed through an extensive pipe line system to communities and industrial centers in the area, and during the year a trunk line system was placed in operation which carries gas to Toulouse and Bordeaux. Crude oil production

Wildcats Completed in France in 1948

Region	Company and Well	Date Completed	Total Depth (Feet)	Results
Alsace Basin:	Pechelbronn Société Anonyme d'Exploitations Minières:			
	22 shallow wells		45,000	3 oil wells (Jurassic and Triassic) 19 dry wells
Aquitaine Basin	Régie Autonome des Pétroles:			
	St. Martory 1	July	10,000	Shows of gas (Cretaceous)
	Aurignac 3	February	7,300	Dry (Cretaceous)
	Plagne 3	May	12,500	Shows of gas (Triassic)
	Richou 2	June	8,150	Dry (Cretaceous)
	Proupiary 3	August	9,250	Dry (Cretaceous)
	St. Marcet 16	December	10,100	Shows of gas and oil (Triassic)
	Five shallow wells		17,200	
	Société Nationale des Pétroles d'Aquitaine:			
	St. Médard	December	10,250	Dry (Triassic)
	Garlin 1	December	6,500	Shows of oil (Jurassic)
	Three shallow wells		9,000	Dry (Triassic)
Languedoc Basin	Société Nationale des Pétroles du Languedoc Méditerranéen:			
	Vaunage 1	January	9,500	Shows of gas (Jurassic), junked
	Quissac 1	August	5,500	Dry (Liassic) junked
	Three shallow wells		8,000	Dry (Jurassic and Triassic)
Totals....	43 Wells	.....	168,250	

Pipe Lines of France

COMPANY	Origin	Terminus	Length (Miles)	Diameter (Inches)	Capacity of Lines (Bbls. Daily)	Year Completed	Status
Crude Oil Lines:							
Standard Française des Pétroles	Le Havre	Notre-Dame-de Gravenchon	22.5	10	55,000	....	In Use
Cie. Française de Raffinage	L'Avéra	La Mède	7	16	90,000	1950	Building
Cie. de Raffinage Shell-Berre	L'Avéra	Berre	20	14	70,000	1950	Building
Refined Product Lines:							
Société de Transport de Pétrole par Canalisation	Le Havre	Paris	160	10	20,000	1950	Planned
Cie. Francaise de Raffinage	La Mède	Caronte	5.5	12	45,000	1952	Planned
			5.5	8	45,000	1952	Planned
Gas Pipe Lines:*							
Régie Autonome des Pétrolas	St. Marcet field	Peyrouset	3	8"	24,700	1942	In use
	St. Marcet field	Boussens	10	9½"	70,000	1947	In use
	Peyrouset	Pau via Tarbes	75	5"	8,500	1946	In use
	Tarbes	Pierrefitte	22	4"	2,000	1946	In use
	Boussens	Toulouse	37	12½"	42,500	1947	In use
	Peyrouset	Toulouse	46	6"	14,000	1942	In use
	Capens	Pamiers	34	5"	3,500	1947	In use
	Boussens	St. Girons	22	4"	6,350	1946	In use
	Toulouse	Bordeaux	155	8"	12,000	1948) 1949)	In use In use
Total.....			....	....	.....		

* Capacity in thousands of cubic feet.

Refineries of France

COMPANY	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Daily Crude Runs End of 1948 (Bbls.)	Type of Refinery	Operating Status
Cie Française de Raffinage	Gonfreville (Le Havre)	50,000	13,500	35,000	Skimming Wax	Enlarging and Operating
	Martigues (Marseille)	35,000	6,400	30,000	Skim-Crk. Asphalt	Operating
Cie. Industrielle des Pétroles	Frontignan (Sète)	8,000	2,700	6,000	Skimming	Rebuilding
Pechelbronn S. A. d'Exp. Minières	Merkwiller (Strasbourg)	1,500	250	1,000	Skim-Lube Asphalt	Badly damaged
Raff. Vacuum Oil Co.	N.D. de Gravenchon (Rouen)	16,000	1,400	14,000	Skimming	Rebuilding
Sté. Générale des Huiles de Pétrole	L'Avéra (Marseille)	25,000	7,500	23,000	Skimming	Operating
	Courchelettes (Douai)	750	None	.....	Lube	Shut down
	Dunkerque	26,000	6,000	.....	Skim-Crk. Asphalt Wax	To be replaced
Cie. de Raffinage Shell-Berre	Petit-Couronne (Rouen)	35,000	2,900	30,000	Skim-Lube Asphalt	Operating
	Pauillac (Bordeaux)	5,000	None	4,500	Asphalt	Operating
	Berre (Marseillé)	25,000	7,500	20,000	Complete	Enlarging and Operating
Raffineries de Pétrole de la Gironde	Ambès (Bordeaux)	14,000	3,000	.....	Skimming	Rebuilding
Standard Française des Pétroles	Port-Jérôme (Le Havre)	45,000	6,000	35,000	Skim-Lube Asphalt	Operating
Raffineries Françaises de Pétrole de L'Atlantique	Donges (St. Nazaire)	15,000	600	11,000	Skim-Lube	Operating

Drilling in France

Region and Field	WELLS COMPLETED IN 1947					WELLS COMPLETED IN 1948					WELLS DRILLING AND SHUT DOWN END 1948		
				Total					Total				
	Oil	Gas	Dry	Wells	Footage	Oil	Gas	Dry	Wells	Footage	Drilling	S.D.	Total
Alsace Basin:													
Pechelbronn	22	..	23	45	69,843	10	..	8	18	52,600	14	..	14
Wildcats	..	..	..	..	.....	3	..	19	22	45,000	..	..	..
Aquitaine Basin:													
St. Marcet	..	2	..	2	16,169	1	1	..	2	14,000	3	..	3
Wildcats	1	..	6	7	58,528	..	..	16	16	100,250	..	..	..
Languedoc Basin:													
Wildcats	..	..	..	..	.....	..	..	5	5	23,000	..	..	..
Totals	23	2	29	54	144,540	14	1	48	63	234,850	17	..	17

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FRANCE—Continued

from the two oil wells in the field amounted to only 12,400 barrels during the year, but more than 112,000 barrels of natural gasoline and butane were recovered in the gasoline plant at Peyrouzet. The Régie Autonome des Pétroles, operator of the field, is now constructing a new plant to have a throughput capacity of 45 million cubic feet daily, the most important plant of its kind in Europe.

It is anticipated that the authorization for prospecting the zone north of the Aquitaine Basin by the Standard Française des Pétroles, an affiliate of Standard Oil Company (N. J.), will be granted some time during 1949.

The French refining capacity has been raised to 261,250 barrels a day, an increase of 91.8 percent during the year, and throughput has increased 89.7 percent. Three war-damaged plants were restored to operation during the year.

Engineering and Geological Data on France Fields

Region and Field	Proved Area (Acres)	Range of Gravity Oil A.P.I.	Name	Kind	Age	Depth (Ft.) Minimum to Top of Pay	Depth (Ft.) Maximum to Bottom of Pay	Avge. Thickness of Pay (Ft.)	Type of Structure
Alsace Basin:									
Pechelbronn	60,000	32	U. Pechelbronn	Sand	Oligocene	600	900	1	Faults
			L. Pechelbronn	Sand	Oligocene	600	1,200	to	Faults
				Dolomite	Oligocene	800	1,600	20	Faults
				Sand	Jurassic	1,300	2,300	2	Faults
			Lettenkuhle	Sand	Triassic	2,900	4,000	to	Faults
			Muschelkalk	Sand	Triassic	2,900	4,000	50	Faults
Aquitaine Basin:									
St. Marcet	....	45 Gas	Brechemarno	Conglomerate	Cretaceous	4,000	6,000	..	.....
				Lime	Jurassic and Liassic	5,000	7,000	..	Anticline
Audignon	....	22.3		Lime	Jurassic	7,130	7,180	50	Anticline
Languedoc Basin:									
Gabian	17	34	Muschelkalk	Dolomite	Lower triassic	205	1,200	30	Faulted anticline

GERMANY

THE total output of crude oil from German fields during 1948 amounted to 4,446,680 barrels, or a little more than 10 percent greater than production during 1947. At the same time the industry succeeded in increasing its drilling volume by 64 percent. There were 187 wells completed to compare with 114 wells drilled in 1947. Early this year it has been

Drilling in Germany

REGIONS AND FIELDS	WELLS COMPLETED IN 1947 Oil	Gas	Dry	Total Wells	Total Footage	WELLS COMPLETED IN 1948 Oil	Gas	Dry	Total Wells	Total Footage	Wells Drilling and Shut Down at End of 1948 Drilling	SD	Total
Baden													
Forst-Weiher	3	....	2	5	11,277	2	....	3	5	12,150	....	....	....
Weingarten	....	....	....	....	.....	1	....	....	1	1,945	1	....	1
Brunswick													
Wildcats	....	....	1	1	3,166	....	....	....	....	.....	....	....	....
East Friesland													
Wildcats	....	....	1	1	3,684	....	....	1	1	4,955	....	....	....
Emsland													
Adorf	....	....	....	....	.....	....	....	1	1	5,771	1	....	1
Bentheim	....	....	....	....	.....	....	....	....	....	.....	1	....	1
Emlichheim	4	....	1	5	14,456	10	....	3	13	36,250	2	2	4
Georgsdorf	9	....	....	9	20,765	20	....	3	23	59,900	5	....	5
Lingen	4	....	....	4	14,209	10	....	1	11	39,100	3	1	4
Wildcats	....	....	6	6	16,530	....	....	7	7	25,041	....	....	....
Hamburg													
Reitbrook	12	....	2	14	22,395	4	....	1	5	8,050	....	....	....
Meckelfeld	....	....	....	....	.....	....	....	....	....	.....	....	....	....
Wildcats	....	....	1	1	10,020	....	....	....	....	.....	....	....	....
Hanover													
Broistedt	....	....	....	....	.....	1	....	1	2	4,803	1	....	1
Calberlah	3	....	3	6	3,503	1	....	1	2	2,723	2	....	2
Ehra	....	....	....	....	.....	....	....	....	....	.....	....	....	....
Eicklingen-Wienhausen	....	....	....	....	.....	....	....	....	....	.....	....	....	....
Etzel	....	....	....	....	.....	....	....	1	1	4,709	1	1	2
Fuhrberg-Hambühren	11	....	3	14	20,601	21	....	4	25	37,297	4	1	5
Gifhorn	....	....	....	....	.....	....	....	....	....	.....	....	....	....
Hademstorf	....	....	....	....	.....	3	....	1	4	17,932	2	....	2
Hohenassel	2	1	2	5	9,698	6	....	2	8	14,125	1	1	2
Mölme	....	....	1	1	1,916	....	....	....	....	.....	....	....	....
Nienhagen-Hanigsen	2	....	2	4	9,016	....	....	5	5	23,100	2	1	3
Oberg	....	....	....	....	.....	....	....	2	2	3,486	....	....	....
Steimbke-Rodewald	5	....	1	6	11,768	10	....	8	18	37,730	2	....	2
Thören	....	....	1	1	4,200	1	....	1	2	17,400	2	....	2
Wesendorf	6	....	2	8	27,887	4	....	4	8	25,311	4	1	5
Wietz	....	....	....	....	.....	....	....	....	....	.....	....	....	....
Wildcats	....	....	2	2	7,418	1	....	27	28	123,301	....	....	....
Muensterland													
Wildcats	....	....	....	....	.....	....	....	1	1	3,752	....	....	....
Oldenburg													
Wildcats	....	....	....	....	.....	....	....	3	3	14,912	....	....	....
Schleswig-Holstein													
Heide	1	....	3	4	15,591	4	....	3	7	23,622	2	1	3
Wildcats	....	....	2	2	7,418	....	....	2	2	5,703	....	....	....
Total	63	1	50	114	290,954	100	....	87	187	547,390	36	11	47

GERMANY—Continued

Refineries of Germany

COMPANY	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Daily Crude Runs End of 1948 (Bbls.)	Type of Refinery	Operating Status
British Occupation Zone						
Deutsche Erdol AG.	Heide (Holst.)	1,440	.....	1,000	Skimming Lubs	Operating
	Wietze (Han.)	950	.....	850	Skimming Lubs, Asphalt	Operating
	Hamburg/ Wilhelmsburg	2,300	.....	.....	Skimming, Lubs, Wax	Heavy Damage
Deutsche Gasoline AG	Dollbergen (Hanover)	1,800	.....	810	Skimming, Lubs, Asphalt	Operating
Deutsche Shell AG.	Hamburg-Harburg	8,400[2]	.....	.....	Skimming, Lubs, Asphalt, Wax	Rebuilding
	Monheim o/Rhine	1,700	.....	1,200	Skim, Lubs, Asphalt	Operating
	Hamburg-Grasbrook	550[1]	.....	527	Lubs	Operating
	Dusseldorf-Reisholz	750[1]	.....	400	Gasoline Rerunning	Operating
	Hamburg-Wilhelmsburg	450[1]	.....	220	Rerunning	Operating
Deutsche Vacuum Oel AG	Bremen-Oslebshausen	2,300	.....	1,850	Skim, Lubs, Wax	Operating
		+9,500[2]	.....	.....	Skimming	
	Wedel o/Elbe (Holstein)	700[1]	.....	470	Lubs, Wax	Operating
Ebano Asphalt-Werke AG (Standard Jersey)	Hamburg-Harburg	11,200[3]	.....	2,700	Skimming Asphalt	Operating
Europaische Tanklager-& Transport AG (Anglo-Iranian)	Hamburg-Finkenwerder	3,500	5,800[2]	.....	Skimming, Cracking	Operating
Gelsenberg Benzin AG	Gelsenberg	14,000	.....	.....	Skimming, Hydrogenation	Operating
Gewerkschaft DEURAGNER-AG	Misburg near Hanover	7,500	3,500	5,500	Complete	Operating
Johann Haltermann	Hamburg-Wilhelmsburg	1,200[1]	.....	270	Gasoline Rerunning	Operating
Mineraloel-& Asphalt werke AH	Ostermoor (Holstein)	1,150	.....	.....	Skimming Asphalt	Shut Down
Mineraloelwerke Albrecht & Co. (Shell)	Hamburg-Grasbrook	230[1]	.....	190	Lubs	Operating
Mineraloelwerke Ernst Jung	Hamburg	120[1]	.....	.....	Lubs	Operating
Mineraloelwerke Peine	Peine (Hanover)	350	.....	290	Skimming Lubs	Operating
Mineraloelwerke Albert Sengewald	Dedenhausen (Hanover)	470	.....	.....	Skimming Lubs	Operating
Oelwerke Julius Schindler GmbH.	Hamburg-Wilhelmsburg	1,150[1]	.....	400	Lubs	Operating
Ernst Schliemann's Oelwerke	Hamburg-Grasbrook	750[1]	.....	130	Lubs	Operating
Union Rheinische Braunkohlen-Kraftstoff AG	Wesseling near Cologne	33,000	7,500	.....	Skimming Hydrogenation	Operating
Wintershall AG.	Salzbergen (Emsland)	1,200	420	800	Complete	Operating
Gebr. Greiser	Dollbergen	75	.....	.....	Skimming Lubs	Operating
American Occupation Zone:						
Zeller & Gmelin	Eislingen (Wuertt.)	150	.....	.....	Skimming	Operating
Griesheim Elektron.	Griesheim	700	.....	.....	Gasoline Rerunning	Operating
French Occupation Zone:						
Badische Anilin-& Soda-Fabrik	Ludwigshafen o/Rhine	700	.....	.....	Wax Asphalt Lubs	Operating
Russian Occupation Zone:						
Mineralölwerke Luetzkendorf	Luetzkendorf near Leipzig	2,200	.....	.....	Complete	Operating

[1] Half-finished products charging capacity.
[2] Capacity after rebuilding.
[3] 7,000 bbls. additional topping capacity rebuilding.

Oil Production and Producing Wells in Germany

REGIONS AND FIELDS	OPERATING COMPANY	Year of Discovery	PRODUCING OIL WELLS END OF 1948			CRUDE OIL PRODUCTION			
			Flowing	Art. Lift	Total Producing	Daily End of 1948	Year 1947	Year 1948	Cumulative Through 1948
Baden									
Forst-Weiher	Itag	1934	....	50	50	47	29,699	27,720	521,000
Weingarten	C. Deilmann	1936	....	63	63	42	14,182	14,560	250,400
Emsland									
Adorf	Preussag, (Gew. Elwerath, Wintershall & C. Deilmann)	1946	....	1	1	80	.....	15,141	15,141
Emlichheim	Wintershall, A. G.	1944	....	27	27	1,530	363,608	453,950	1,058,000
Georgsdorf	Preussag (Gew. Elwerath, Wintershall & C. Deilmann, 20 percent each)	1944	44	3	47	1,318	169,021	371,672	736,600
Lingen	Schachtbau & Tiefbohr-Ges, M.B.H. (Gew. Elwerath 50 percent)	1942	....	49	49	1,039	265,042	334,166	1,180,000
Hamburg									
Meckelfeld	Wintershall A. G. (Gew. Elwerath, 50 percent)	1938	....	25	25	49	13,566	14,847	319,000
Reitbrook	Preussag & Deutsche Vacuum Oel A.G. (51:49 percent)	1937	44	59	103	714	241,895	269,101	8,120,000
Hanover									
Broistedt	Preussag & Gewerkschaft Elwerath (50-50 percent)	1937	....	6	6	72	20,014	28,441	190,000
Calberlah	Gewerkschaft Elwerath	1945	....	4	4	9	2,762	3,129	12,000
Eddesse-Olheim	Preussag, Deutsche Erdoel A.G.	1876	....	14	14	43	18,482	16,450	1,626,500
Ehra	Deutsche Erdoel A.G.	1939	....	17	17	15	4,524	4,284	64,300
Eicklingen-Wienhausen	Wintershall A.G. Gewerkschaft Elwerath, Itag	1937	....	18	18	221	94,650	91,308	1,661,000
Eilte	Deutsche Vacuum Oel A.G.	1947	....	1	1	9	600	1,708	2,308
Etzel	Preussag	1942	....	2	2	68	29,204	31,031	148,000
Fuhrberg-Hambühren	Wintershall A. G. Gewerkschaft Brigitta, Itag, Hambuhren	1939	....	187	187	956	296,762	334,208	2,654,000
Gifhorn	Deutsche Erdoel A.G.	1935	....	37	37	31	10,699	9,135	279,100
Hademstorf	Deutsche Vacuum Oel A.G.	1941	....	8	8	339	39,748	65,919	290,000
Hohenassel	Gewerkschaft Elwerath (Preussage & Braunschweigische-33⅓ percent each)	1943	....	16	16	354	139,447	131,649	971,000
Mölme	Gewerkschaft Elwerath	1935	....	45	45	110	34,468	33,131	949,000
Nienhagen-Hanigsen	Gewerkschaft Elwerath, Wintershall A.G., Deutsche Vacuum Oel A.G., Itag, Ferdinand Koller & Sohn, Deutsche Erdoel A.G.	1889 1940	1	225	226	2,336	940,580	870,821	31,191,000
Oberg	Deutsche Vacuum Oel A.G., Itag, G. Greiser	1919	....	57	57	118	39,538	39,767	2,200,000
Steimbke-Rodewald	Gewerkschaft Brigitta	1936	4	138	142	860	290,028	290,850	3,002,000
Stemmerberg	Gewerkschaft Elwerath	1948	....	1	1	2	.....	714	714
Thören	Deutsche Erdoel A.G., (Gewerkschaft Brigitta & Vacuum)	1941	....	55	55	357	120,454	120,470	910,500
Wessendorf	Deutsche Erdoel A.G., Gew. Elwerath & Preussag	1943	21	4	25	1,047	311,790	356,202	1,630,000
Weitze	Deutsche Erdoel A.G.	1874	....	310	310	442	149,140	161,385	16,431,000
Schleswig-Holstein									
Heide	Deutsche Erdoel A.G.	1935	....	47	47	1,062	392,405	354,921	8,554,000
Total			114	1,469	1,583	13,270	4,032,308	4,446,680	85,966,563

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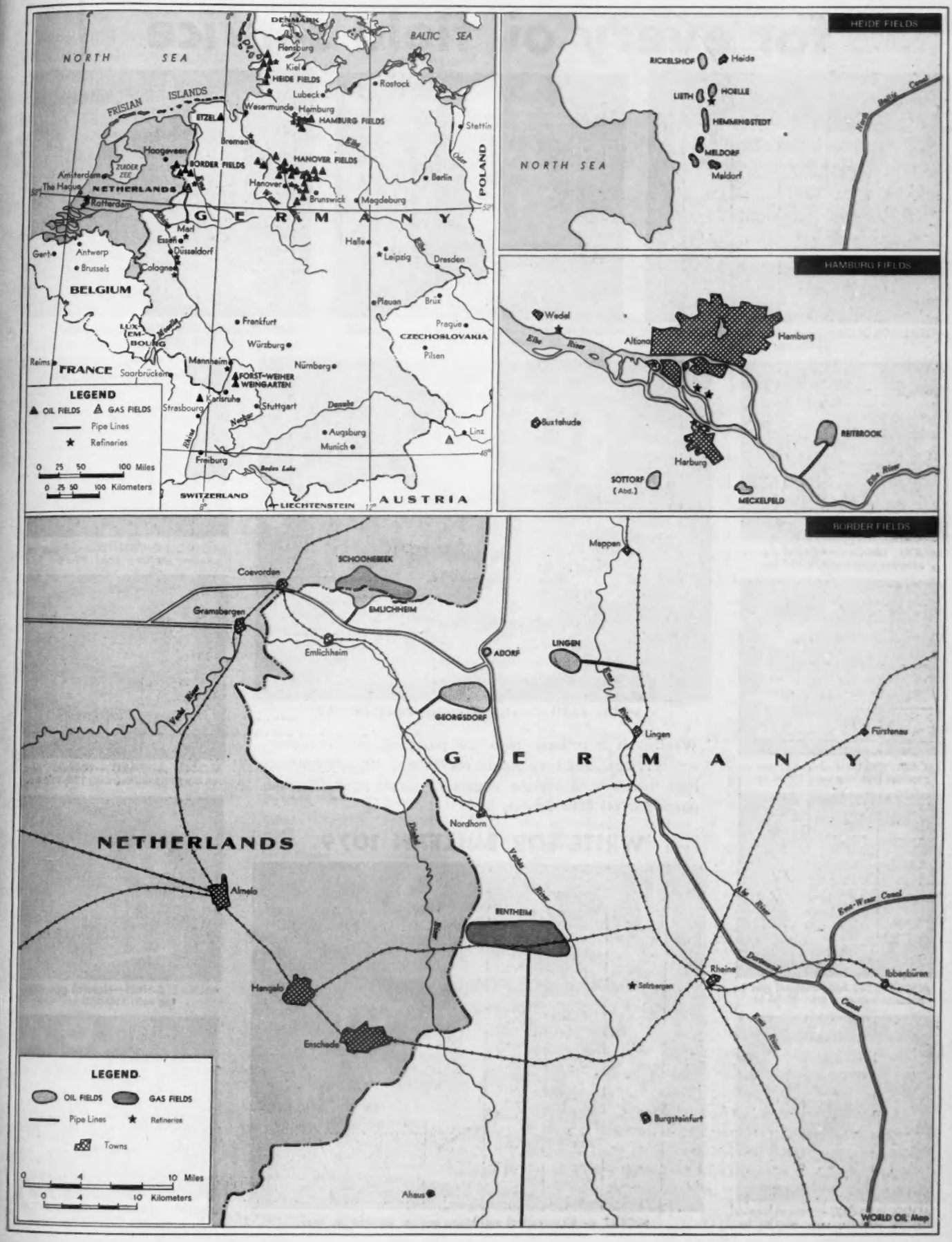

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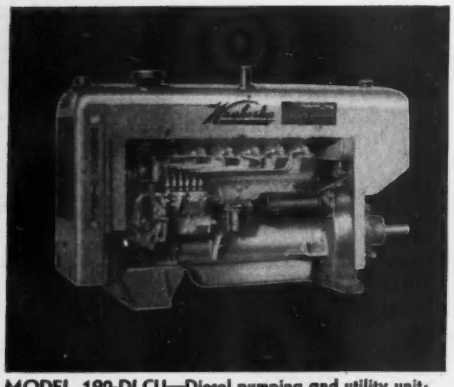
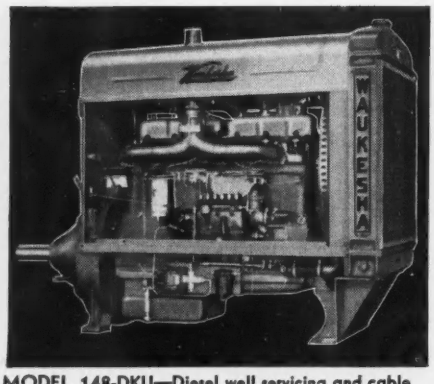
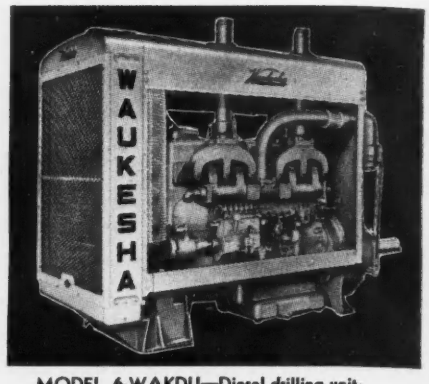


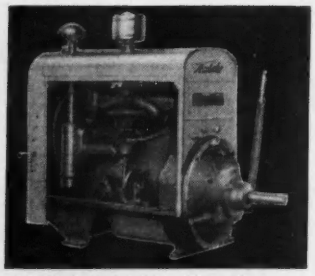
MODEL 190-DLCU—Diesel pumping and utility unit; 25-53 hp.



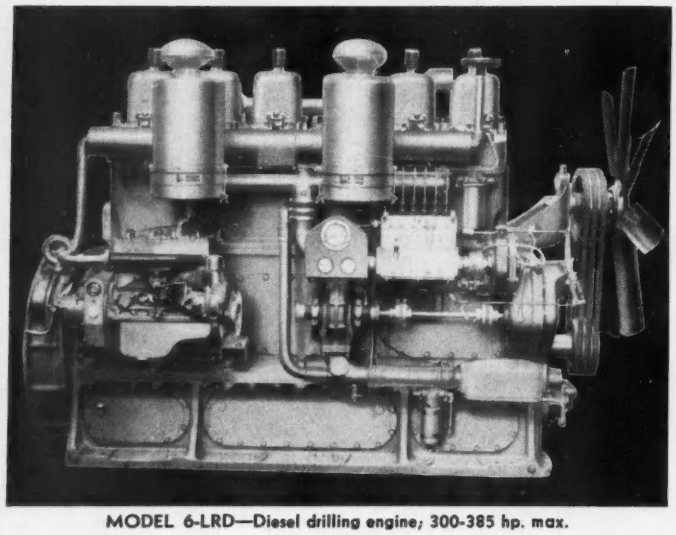
MODEL 148-DKU—Diesel well servicing and cable tool drilling unit; 86-180 hp.



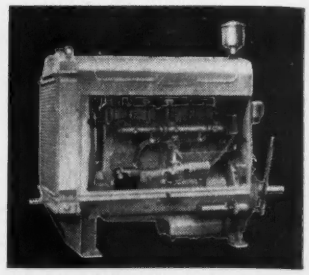
MODEL 6-WAKDU—Diesel drilling unit; 121-210 hp.



MODEL 180-GLU—Natural gas or gasoline utility unit; 20-32 hp.



MODEL 6-LRD—Diesel drilling engine; 300-385 hp. max.



MODEL 145-GKU—Natural gas or gasoline servicing unit; 89-184 hp.

MODEL 190-GLU—Natural gas or gasoline pumping unit; 29-58 hp.

MODEL 6-WAKU — Natural gas servicing and drilling unit; 138-226 hp.

Whether it is drilling, pipe line pumping, well pumping, well servicing, auxiliary plants, recycling or refinery processing—there's a Waukesha engine or power unit for that particular oil field service.

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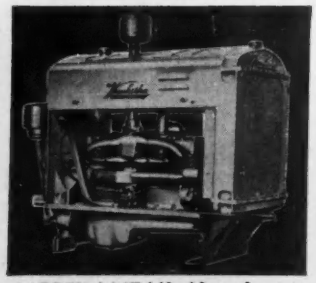
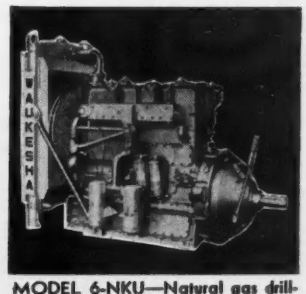
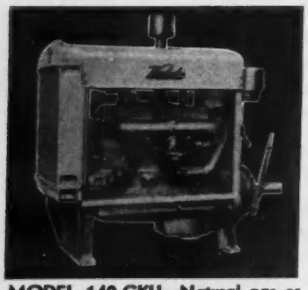


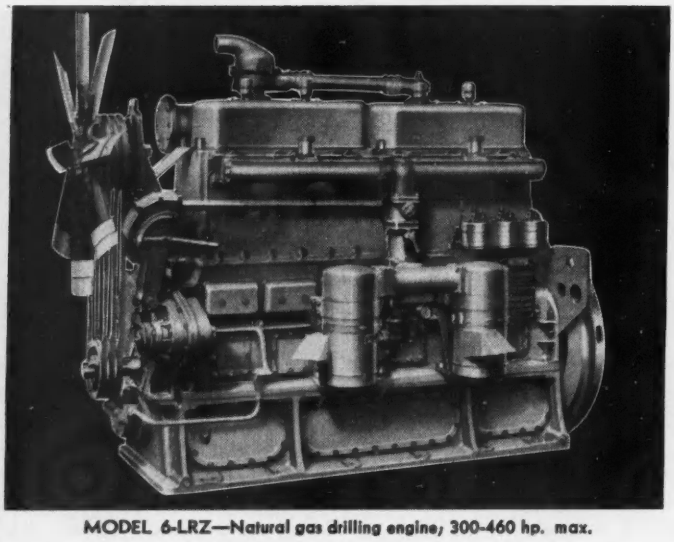
MODEL 6-MZAU—Natural gas or gasoline pumping unit; 40-86 hp.



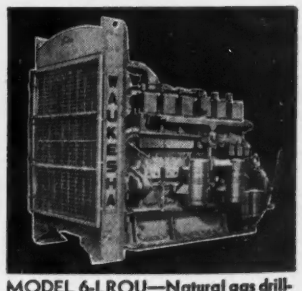
MODEL 6-NKU—Natural gas drilling unit; 150-225 hp.



MODEL 140-GKU—Natural gas or gasoline servicing unit; 66-130 hp.



MODEL 6-LRZ—Natural gas drilling engine; 300-460 hp. max.



MODEL 6-LROU—Natural gas drilling unit; 250-409 hp.

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forecast that there will be an increase of 15 percent in oil output during 1949, and an increase of more than 100 percent in the footage drilled.

Although it was somewhat of a surprise that most of the fields in the older areas such as Hanover and the Schleswig-Holstein - Hamburg regions managed to hold their own through intensive development, it was the fields of the Emsland region which made it possible for Germany to show an increase in production. In forecasting a further increase which would bring total output to more than 5,160,000 barrels during 1949 it is the Emsland fields that are expected to contribute the difference.

Emlichheim, Adorf, Georgsdorf and Lingen fields, the Emsland producing structures, accounted for approximately 26 percent of the 1948 production, and it is expected that during this coming year they will produce 34 percent of the nation's oil. Early in the year it was apparent that these forecasts may be realized, since production from the Emsland continues to occupy an increasingly large part in the total.

The Nienhagen-Hänigsen field of the Hanover region is still the largest single producer of oil in the country, but it is definitely on the decline, since the 870,821 barrels produced during 1948 represented a drop of more than 7 percent during the past year. The decline was offset by increases at Hademsdorf, Fuhrberg-Hambühren and Wesendorf, where vigorous exploration has brought some small new areas into production. Nienhagen-Hänigsen has accounted for 37 percent of all of the cumulative production from Germany, but the decline is now definite and alarming.

The new drilling program laid out for 1949 places additional emphasis on wildcatting. During 1948 there were 41 wildcats drilled, or nearly 50 percent more than were drilled in 1947, but the 1949 goal is for 157 wildcats out of a total of 368 wells to be drilled. In addition to the wildcats there are to be 36 extension tests drilled this year as against the 16 such exploratory tests drilled in 1948.

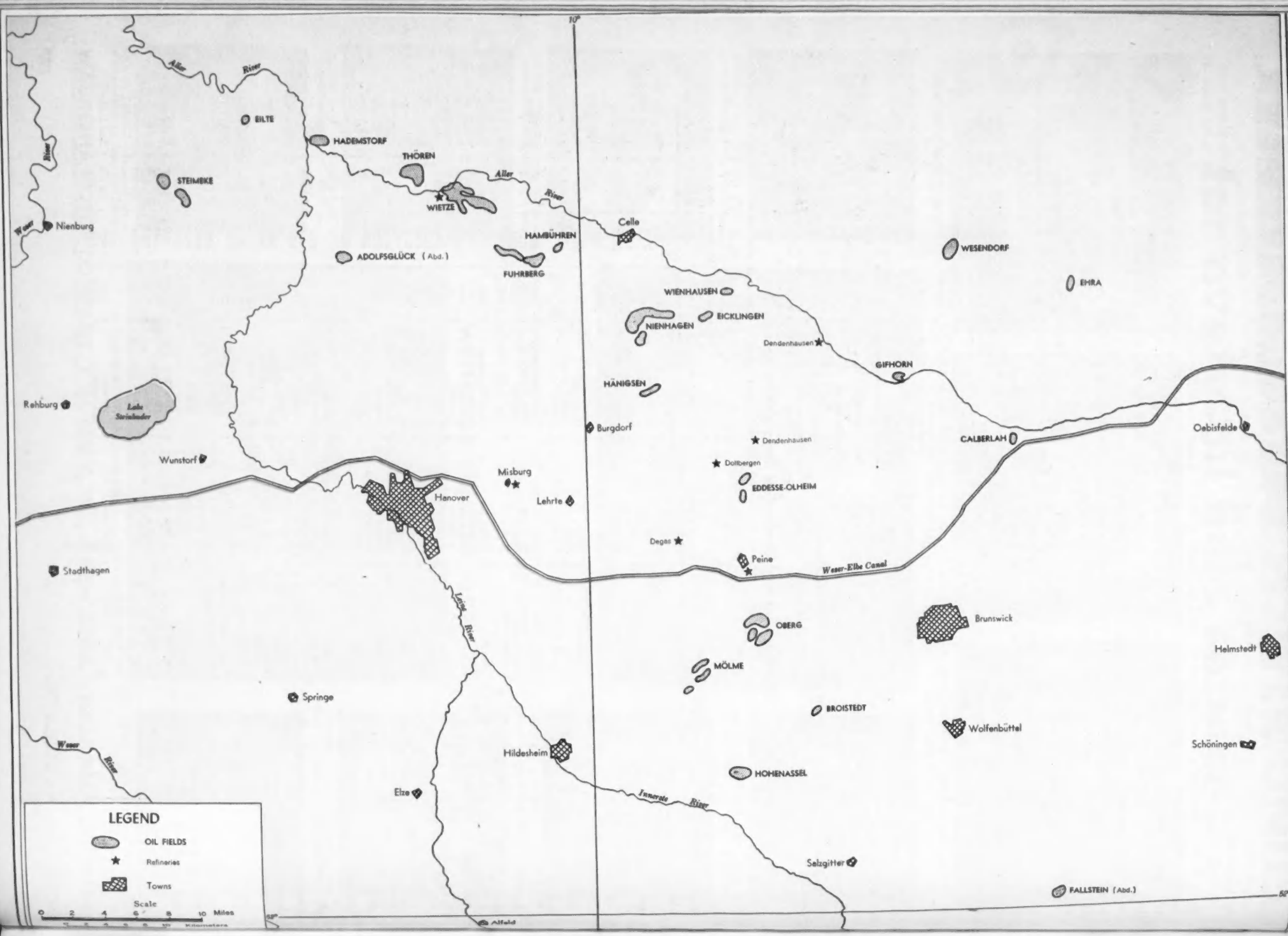
Steady progress has been made during the past year in

Pipe Lines of Germany

COMPANY	Origin Field or Town)	Terminus	Length (Miles)	Diameter (In.)	Capacity of Line (Bbls. Daily)	Year Completed	Status
Crude Oil Lines:							
Deutsche Schachtbau & Tiefbohr —GmbH.	Lingen	Railway at Geeste	5	6″	13,500	1945	In use
Erdoelbetrieb Reitbrook (Socony-Vacuum & Preussag)	Reitbrook	Warwisch on River Elbe	5	8″ & 6″	.....	1939	In use
Preussag.....	Georgsdorf	Railway at Veldhausen	3.5	2-4″	.....	1948	In use
Wintershall AG....	Emlichheim	Railway at Emlichheim	3.5	4″	4,700	1948	In use
Natural Gas Lines:							
C. Deilmann Bergbau GmbH.	Bentheim	Huels (near Marl)	48	8″	18 mill. cb. ft.)	1943	In use

Engineering and Geological Data on German Fields

REGION and FIELD	Est. Proved Area (Acres)	Gravity Oil (API)	Name	Kind	Age	DEPTH (Feet) Minimum Top Pay	DEPTH (Feet) Maximum Total Depth	Average Thickness Pay (Ft.)	Type of Structure
Baden:									
Forst-Weiher.....	....	....	.....	.....	.....	....	....	....	Tilted fault blocks
Weingarten.....	500	32–36	Meletta	Sand	M. Oligocene	800	1600	230–500	Tilted fault blocks
Emsland:									
Adorf.....	120	31	Wealden	Shell beds	Lower Cretaceous	4050	4400	350	Anticline
Bentheim.....	2970	....	Platten-dolomite	Dolomite	Sechstein Permian	5130	5650	115	Anticline
Emlichheim.....	....	25	Bentheim sandstone (Valendis)	Sand	Cretaceous	2430	2890	89	Anticline
Georgsdorf.....	2500	24	Bentheim sandstone (Valendis)	Sand	Cretaceous	1600	3300	130	Anticline
Lingen.....	....	31–32.5	Valendis	Sand	Lower Cretaceous	2760	3870	460	Anticline
			Wealden Serpulite	Lime	Jurassic				
Hamburg:									
Meckelfeld.....	....	24	Reitbrook beds	Lime	Upper Cretaceous	985	1380	65–100	Salt Dome
			Lower Cretaceous	Sandstone	Lower Cretaceous	1480	1670	40–65	
Reitbrook.....	850	21–23	Lower Eocene	Sand	Tertiary	1460	1635	20	Salt Dome
			Reitbrook beds	Lime	Upper Cretaceous	2100	2600	115	Salt Dome
Hanover:									
Broistedt.....	25	33	Valendis	Sandstone	Lower Cretaceous	2400	3200	16–65	Salt Dome
Calberlah.....	1.2	19–22	Dogger	Sandstone	Jurassic	160	400	16–20	Salt Dome
Eddesse-Olheim.....	50	32	Rhaetic	Sandstone	Triassic	2800	3300	20–40	Salt Dome
Ehrs.....	75	16.5	Lower Dogger	Sandstone	Jurassic	490	820	33	Salt Dome
Eicklingen-Wienhausen..	....	33	Valendis Wealden	Sandstone	Lower Cretaceous	1670	3050	65	Salt Dome
Eilte.....	....	23	Wealden	Sand	Lower Cretaceous	3560	3700	55	Salt Dome
Etzel.....	75	13	Cap Rock	Lime Breccia	Jurassic	4560	4700	33	Salt Dome
Fuhrberg-Hambühren...	....	23	Cornbrash (U. Doffer)	Sandstone	Jurassic	260	1930	115–130	Salt Dome
Gifhorn.....	60	17	Wealden	Sandstone	Cretaceous	660	820	100	Salt Dome
Hademstorf.....	75	25.5	Wealden	Sand	Cretaceous	4270	4440	25	Salt Dome
Hohenassel.....	50	30	Coral dolite	Lime-stone	Jurassic	1280	2070	130	Salt Dome
Mölme.....	100	32	Wealden Coral dolite	Sandstone, Limestone	Cretaceous, Jurassic	160	1800	30–100	Salt Dome
			Rhaetic	Sandstone	Triassic				
Nienhagen.....	4250	22.5—	Valendis	Sand	Lower Cretaceous	600	5350	65	Salt Dome
		32.5	Wealden	Sandstone	.....	....	....	30	
			Cornbrash	Lime-Sandstone	Jurassic	....	....	65	
Nienhagen-Hanigsen....	100	24.5—	Valendis	Sand	Lower Cretaceous	2245	2770	82	Salt Dome
		28	Wealden	Sand					
Oberg.....	600	36.5—	Wealden	Sand	Lower Cretaceous	520	1910	20	Salt Dome
		40	Lower Dogger	Sand	Jurassic				
Steimbke-Rodewald.....	200	19	Wealden	Sand	Lower Cretaceous	660	1030	65	Salt Dome
			Serpulite	Lime	Upper Jurassic	820	2460	20	
			Cornbrash	Sandstone, Limestone	Middle Jurassic	950	2130	72	
Stemmerberg.....	....	....	Cornbrash	Sandstone	Jurassic	n.a.	3947	n.a.	Salt Dome
Thören.....	125	17.8—	Wealden	Sandstone	L C etaceous	1575	1720	165	Salt Dome
		35.5	Upper Dogger (Cornbrash)	Sandstone, Limestone	Jurassic	2829	2990	130	
			Rhaetic	Sandstone	Triassic	....	4000	65	
Wesendorf.....	320	35.5	Lower Dogger	Sandstone	Jurassic	2630	3800	7–40	Salt Dome
			Liassic	Sandstone	Jurassic	....	6000	100	
Wietze.....	570	18—	Senonian	Sandstone	Cretaceous	300	1000	30–65	Salt Dome
		27	Wealden	Sandstone	Cretaceous	300—	1000	200	
			Upper Dogger	Sandstone	Jurassic	300	1000	200	
			Rhaetic	Sandstone	Triassic	590	1080	80–100	
Schleswig-Holstein:									
Heide.....	1250	31	Basal breccia of the Lower Cretaceous	Sandstone	Cretaceous	2950	4500	30–130	Salt Dome
			Zechstein	Limestone	Palaeozoic	2590	3600	26	



GERMANY—Hanover Fields

GERMANY—Continued

restoration of refining capacity in Germany, resulting in an increase of 19 percent in the amount of products turned out during 1948. Current programs call for a still greater increase during the coming year, as a result of increased quantities of available crude, both domestic and imported. An additional capacity of 47,000 barrels a day has been made available through the releasing by the Allied Control Commission of two of the great hydrogenation plants for the processing of imported crude oil. The plants are located at Wesseling and at Gelsenberg, the former having a throughput crude oil capacity of 33,000 barrels and the latter capable of handling 14,000 barrels a day. Both of these went on stream early in 1949. Later in the year large-scale repair work and extensions will be completed on refineries at Harburg, Oslebshausen, Misburg and Finkenwerder. The net result will be reduced necessity for import of finished products. Heating oils and lubricants from domestic plants will meet demands, but it will still be necessary to import gasoline and diesel fuel.

The Anglo-Iranian Oil Company has acquired the Eurotank Refinery at Hamburg and will complete its rehabilitation so that it can handle approximately 8,500 barrels of crude a day.

Wildcats Completed in Germany in 1948

REGION COMPANY, WELL, LOCATION	Date Completed	Total Depth (Ft.)	Results, Formation
East Friesland			
Gewerkschaft Elwerath Barkholt 2, 18 miles northwest Etzel field	7-15	4955	Dry, Zechstein salt
Emsland			
C. Deilmann Bergbau GmbH. Itterbeck 4, southwest of Georgsdorf field	7-30	2551	Dry, Muschelkalk. Shows in Wealden and Gildehaeuser sandstone (Cretaceous)
Deutsche Erdoel A.G. Menslage 2, east of Lingen field.	3-31	4570	Dry, Dogger (Jurassic)
Deutsche Schachtbau & Tiefbohr AG. Apeldorn 2, 15 miles northeast Lingen field	6-	3010	Dry, Cenomanian (Cretaceous)
ITAG Lastrup 4, northeast Lingen field	3-22	4071	Dry, Dogger
ITAG, Wettrup 1, east of Lingen field	8-29	3725	Dry, Wealden
Wintershall AG. Messingen 2, southeast Lingen field	5-28	3620	Dry, Dogger
Wintershall A.G. Ruehlertwist 1, east of Schoonebeek-Emlichheim field	12- 8	3494	Dry, Bentheim sandstone (Valendis)
Hanover			
Braunschweigische Bohrgesellschaft Burgdorf B 1, southwest Nienhagen field	8-10	2536	Dry, Rhaetic
Braunschweigische Bohrgesellschaft Burgdorf B 2, southwest Nienhagen field	11-27	1248	Dry, Liassic
Braunschweigische Bohrgesellschaft Hohenassel-Osterlinde 1, near Hohenassel field	3-22	3438	Dry, Coral oolite (Jurassic) Shows in Kimmeridge
Deutsche Erdoel AG. Bevern 2, 30 miles west of Hamburg	9-25	6562	Dry, Zechstein (Paleozoic)
Deutsche Erdoel AG. Eitzendorf 4, 15 miles northwest Steimbke field	10- 7	6082	Dry, Liassic, Oil and gas shows in Valendis
Deutsche Erdoel AG. Hardesse 2, 7 miles west of Gifhorn field	12-22	5186	Dry, Dogger. Show in Wealden
Deutsch Vacuum Oel AG. Eilte 5, 3 miles west of Hademstorf field	7-18	4197	Dry, Wealden
Gewerkschaft Brigitta Hope-Nord 1, east of Steimbke field	7-22	6494	Dry, Lower Cretaceous
Gewerkschaft Brigitta Rodewald WA 401, east of Steimbke field	7-10	2871	Dry, Muender marl (Malm. Jurassic)
Gewerkschaft Elwerath Aschwarden 2, 17 miles northwest Bremen	6-30	5919	Dry, Rhaetic (Triassic)
Gewerkschaft Elwerath Bargstedt 2, 20 miles west of Hamburg	2- 5	2822	Dry, Zechstein (Paleozoic)
Gewerkschaft Elwerath Bodenteich 4, 16 miles northeast Wesendorf field	7-22	6039	Dry, Liassic
Gewerkschaft Elwerath Boitzenhagen 2, northeast Ehra field	5-13	2709	Dry, Liassic
Gewerkschaft Elwerath Duingen 1, 20 miles southwest Hohenassel field	8- 3	3628	Dry, Malm. Oil shows in Oolite lime
Gewerkschaft Elwerath Regina 25, west of Steimbke field	3-16	3821	Dry, Lower Cretaceous
Gewerkschaft Elwerath Schillerslage 1, southwest of Nienhagen field	5- 4	5619	Dry, Wealden
Gewerkschaft Elwerath Scholen 4, 25 miles south of Bremen	9-28	3955	Dry, Liassic
Gewerkschaft Elwerath, Stemmerberg 4, 6 miles southwest of Hanover	12-4-47	3947	Small producer, Cornbrash (Jurassic) sandstone, 1-2 bbls. heavy oil daily
Gewerkschaft Elwerath Wiswedel 6, 8 miles northeast Ehra field	6- 4	1833	Dry, Muschelkalk
Gewerkschaft Elwerath Wiswedel 7, 8 miles northeast Ehra field	12-16	3244	Dry, Liassic
ITAG Barrien 1, 7 miles south of Bremen	1-10	5154	Dry, Rhaetic
Ferd. Koller & Sohn Celle 3, near Celle	10-	5404	Dry, Wealden
Louis Ritz & Co. Luellau-Toepe 4, 15 miles south of Hamburg	6-30	4750	Dry
Wintershall AG. Bahnsen 3, 22 miles north Wesendorf field	2-17	7382	Dry, Anhydrite (Paleozoic)
Wintershall AG. Bahnsen 4, 22 miles north Wesendorf field	10- 2	7856	Dry, Anhydrite (Paleozoic)
Wintershall AG. Flachstoeckheim 3, 11 miles southeast Hohenassel field	12-10	3215	Dry, Rhaetic
Wintershall AG. Schneflingen 6, 10 miles northeast Wesendorf field	8- 9	3824	Dry, Liassic
Wintershall AG. Schneflingen 7, 10 miles northeast Wesendorf field	12-12	3566	Dry, Dogger
Muensterland			
C. Deilmann Bergbau GmbH. Ascheberg KM 1, 10 miles south Muenster	11-24-47	3752	Dry, Carboniferous. Gas shows
Oldenburg			
Deutsche Vacuum Oel AG. Dangast 1, North Sea Coast	6- 7	5912	Dry, Keuper
Deutsche Vacuum Oel AG. Zwischenahn 5, 20 miles southeast Etzel field	10-20	6416	Dry, Wealden
Deutsche Vacuum Oel AG. Quakenbrueck 3, 25 mi. northeast Lingen field	10- 8	2584	Dry, Dogger
Schleswig-Holstein			
Deutsche Erdoel AG. Holstein-Meldorf 78, south of Heide field	9-20	3188	Dry, Zechstein (Paleozoic)
Gewerkschaft Elwerath Hohenhorn 10, 8 miles east Reitbrook field	2—19	2515	Dry, Upper Cretaceous. Shows in Eocene. Tested 10 gal. oil and salt water.

GREAT BRITAIN

GREAT Britain's oil production, never extensive, has suffered a further drop in 1948. Total output from British fields amounted to only 323,400 barrels, an average of 923 barrels daily at the end of the year, and represents a decline from 351,009 barrels in 1947.

The attempts to bolster this production have been along the lines of searching for new sources of production rather than in development work in the fields themselves. During 1948 there were no field wells completed, although it is understood that two rigs were running in fields at the close of the year. In 1947, only eight field wells had been drilled, in addition to four wildcats. The 1948 completions consisted of eight wildcats representing a total of 21,397 feet of hole drilled, all by the D'Arcy Exploration Company, Ltd. The wildcats were all in the Midlands region, and the most encouraging show found was in the Kirklington 1, about 7 miles northwest of Newark which drilled to 2796 feet, finding shows of oil in the Lower Carboniferous, but which also showed salt water. A very slight showing was also noted in Hockerton 2, about a mile from the Kirklington well, although in this case the shows amounted to no more than slight traces of oil. A small gas show was also found in the Willesden 1, northwest of London. No other showings were found, and none of the wells were drilled to any great depth.

The Eakring and Duke's Wood fields again accounted for most of the crude oil production, with a combined output of 243,000 barrels. Although this is only 9,000 barrels less than was produced in 1947, it is reported that the decline would have been much greater but for the institution of secondary recovery practices in the form of water injection.

Meanwhile Britain continues to build up its refining

Facts Worth Knowing About Rolo Wellcheckers

Rolo Wellcheckers are oil and gas separators, designed to record the oil, gas and B. S. & W. produced by individual wells.

Originally developed by the Rolo Manufacturing Company as a mobile test unit, increasing numbers of skid-mounted Wellcheckers are now being manufactured for permanent installation in major oil fields throughout the world. This is an impressive tribute to the efficiency and practical money-saving advantages of this unit as a means of securing accurate individual oil well data.

Rolo Wellcheckers are manufactured in various types, models and capacities. Increasingly in demand are the horizontal models, which may be mounted on "Level-Load" trailers for mobility or skid-mounted for permanent installation.

In addition, Rolo Manufacturing Company produces custom-built units to meet special requirements, such as the two-stage unit which can also be operated as two independent Wellcheckers.

Rolo Wellcheckers are shipped complete with oil line, gas run, oil meter, orifice flange or fitting and gas meter, and all necessary valves . . . completely ready to operate. All vessels are API-ASME Code labeled.

During 1948, Rolo Wellcheckers achieved truly world-wide acceptance by major oil producers. In a recent interview, Mr. Robert K. (Bob) Franklin, who is pictured above standing beside one of the latest-model Mobile Horizontal Wellcheckers, said:

"In Texas alone, last year, 46 Rolo units were shipped to a single operator for permanent installation in a newly discovered field. This particular operator is producing 23 leases into three tank batteries. Without Rolo Wellcheckers, it would have been necessary for him to set up 20 additional tank batteries at appreciably greater expense than the cost of his 46 Rolos.

"Also in 1948, 17 complete Rolo Wellcheckers along with 30 (1½") PAD Meters and Samplers, were shipped to one operator in Eastern Venezuela. Also large quantities were shipped to oil fields throughout the United States, Canada, Mexico and South America, as well as to many other oil producing points on the globe as far away as Sumatra, Dutch East Indies.

"Naturally, we at Rolo Manufacturing Company are gratified by these material evidences that Rolo Wellcheckers are performing accurately and dependably under severe conditions, in all climates, everywhere. We are particularly grateful to the many oil operators whose suggestions and comments, based on practical oil field experience, have enabled us to make improvements in our product through the years."

Mr. Franklin and his associates at Rolo Manufacturing Company are primarily oil well metering specialists. A competent engineering department is maintained to analyze individual problems, to layout and recommend complete metering systems to enable the operator to produce any number of wells into one or more tank batteries. Rolo Wellcheckers thus make it possible for the operator to check his well production daily, securing accurate records on which to compute royalties and taxes.

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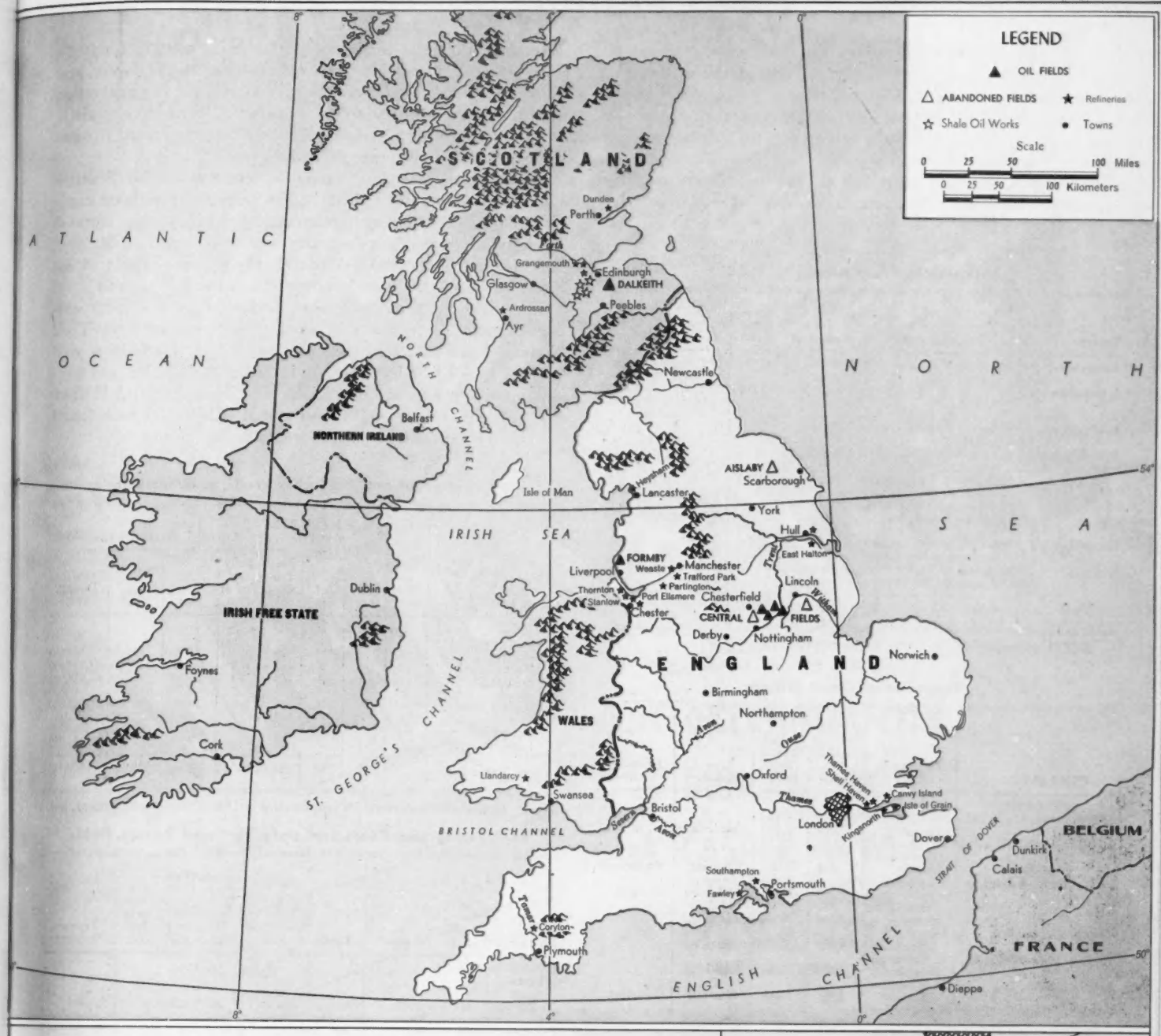
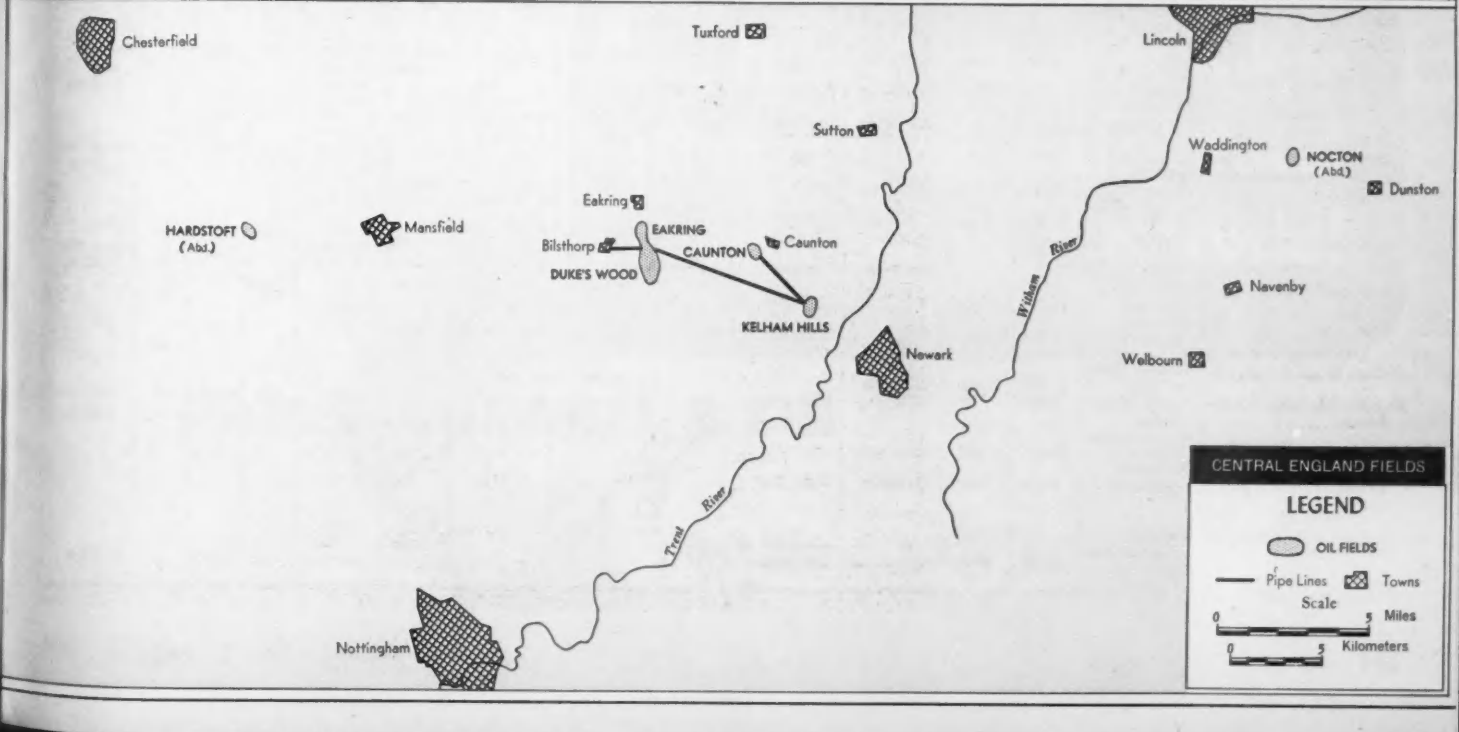
GREAT BRITAIN





GREAT BRITAIN—Continued

industry. During the year additional construction added to the capacity by nearly 10,000 barrels, and at the end of the year the refineries operating, building, or expanding had a total rated capacity of just over 150,000 barrels. Since the first of the year several units have gone on stream, adding capacity not included in this total.

Recently a closer integration of the petroleum refining industry with the general economic and industrial activity was evidenced by construction of a pipe line from the Ellesmere Port gas works to the Lobitos Oilfields Limited's refinery. The line will carry excess refinery gas over and above that used for the cracking units and for the generation of steam at the refinery, to the Ellesmere Port works to assist in handling the peak loads of the distribution system. Around 2,000 tons of coal a year is to be saved.

In Scotland, the Grangemouth refinery of the Scottish Oils Limited, now rated at 10,000 barrels throughput capacity daily, is starting construction which will increase capacity to 30,000 barrels a day and will include additional facilities such as a 3,000 barrel phosphoric acid treating plant and an 8,000 barrel copper chloride treating unit.

Imperial Chemical Industries, Ltd., has secured prospecting licenses on about 169 square miles of land in York County where showings of gas had been found in a well at Aislaby drilled by D'Arcy. It hopes to develop gas production for use in its operations at Billingham and Wilton. In 1939 the D'Arcy well found gas at 4254 feet which tested 2.5 million cubic feet daily potential.

Wildcats in Great Britain in 1948

County	Well and Location	Date Completed	Total Depth (Feet)	Results
Hampshire	Portsdown 2, 5 miles north of Portsdown.	March	2,871	Dry; upper Jurassic
Lincolnshire	Eagle Moor 1, 7 miles south-of Lincoln.	May	3,418	Dry; slight show of oil and gas; Lower Carboniferous.
London	Willesden 1, northwest of London.	January	2,680	Gas—traces only; Upper Devonian.
Nottinghamshire	Farndon 2, 2 miles east of Newark.	January	2,545	Dry; Lower Carboniferous.
	Hockerton 2, 6 miles northwest of Newark.	August	2,954	Oil—traces only; Lower Carboniferous.
	Kirklington 1, 7 miles northwest of Newark.	October	2,796	Shows of oil and water; Lower Carboniferous.
Shropshire	Stoke-on-Tern 1, 8 miles southeast of Newport.	April	1,832	Dry; Lower Carboniferous.
	Tern Hill 1, 4 miles southwest of Market Drayton.	December	2,301	Dry; Lower Carboniferous.
Total	8 wells		21,397	

NOTE: All drilling done by D'Arcy Exploration Company.

Refineries of Great Britain

COMPANY	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Type of Refinery	Operating Status
ENGLAND:					
A.G.W.I. Pet. Corp. Ltd.	Fawley (South Hampton)	14,000	8,000	Complete	.....
Anglo-American Oil Co., Ltd.	Pt. Ellesmere (W. Cheshire)				
	Chester	500	None	Skimming	Expanding
Berry, Wiggins & Co., Ltd.	Kingsnorth (Kent)	2,500	None	Skim-Lube	Operating
	Weaste (Manchester)	1,500	None	Skimming	.....
Cory Bros. & Co., Ltd.	Coryton (Devonshire)	4,000	2,000	Skim-Crack	.....
Herbert Green & Co., Ltd.	E. Halton (on Humber R.)	1,500	None	Skim-Lube	.....
Lobitos Oilfields, Ltd.	Pt. Ellesmere (Cheshire)	3,000	None	Skimming	Operating
London & Thames Haven Oil Wharves, Ltd.	Canvey Island (Essex)	1,500	None	Skimming	.....
	Thames Haven (London)	18,000	None	Skim-Lube	.....
Major & Co., Ltd.	Hull (Yorkshire)	1,250	None	Skim-Lube	.....
Manchester Oil Refinery, Ltd.	Trafford Park (Manchester)	3,000	None	Skim-Lube	Operating
Petrochemicals, Ltd.	Partington (Manchester)	n. a.	n. a.	Complete	Building
Shell Chemical Mfg. Co., Ltd.	Stanlow (Pt. Ellesmere)	600	None	.....	Expanding
Shell Refining & Marketing Co., Ltd.	Shell Haven (London)	3,600	None	.....	Operating
	Stanlow (Pt. Ellesmere)	5,700	None	Complete	Expanding
	Heysham (Near Lancaster)	30,000	None	Skimming	Completing
Starhaven Refineries, Ltd.	Shell Haven, (London)	13,000	None	Complete	Operating
	Stanlow (Pt. Ellesmere)	11,000	None	.....	Operating
SCOTLAND:					
William Briggs & Sons, Ltd.	Dundee (Firth of Tay)	600	None	Skimming	.....
Scottish Oils, Ltd., (Anglo-Iranian)	Uphall (Edinburgh)	3,000	500	Skim-Crack	Shut Down
	Grangemouth (Stirling)	10,000	None	Skimming	Operating
Starhaven Refineries, Ltd. (Shell)	Ardrossan (Ayrshire)	4,300	None	Complete	Operating
WALES:					
National Oil Refineries, Ltd. (Anglo-Iranian)	Llandarcy (Carmarthen, Swansea)	18,000	None	Skim-Lube	Operating

Oil Production and Producing Wells in Great Britain

County and Field	Year of Discovery	Producing Oil Wells End of 1948			Crude Oil Production (Barrels)			
		Flowing	Art. Lift	Total Producing	Daily at End of 1948	Year 1947	Year 1948	Cumulative Through 1948
ENGLAND:								
Nottinghamshire:								
Caunton	1943	..	10	10	28	20,000	12,000	154,000
Duke's Wood	1941	1	112	113	400	154,000	152,000	1,884,000
Eakring	1939	1	54	55	330	98,000	91,000	1,157,000
Formby	1939	..	8	8	5	2,700	2,200	59,000
Kelham Hills	1941	..	54	54	160	75,000	65,000	858,000
SCOTLAND:								
Midlothian:								
Dalkeith	....	..	2	2	..	1,309	1,200	17,739
Total		2	240	242	923	351,009	323,400	4,129,739

NOTE: All producing fields except Dalkeith operated by D'Arcy Exploration Company, Ltd.

Engineering and Geological Data on Great Britain Fields

COUNTY AND FIELD	Range of Gravity Oil (A.P.I)	Name	Kind	Geological Age	Depth (Ft.) Min. Top of Pay	Depth (Ft.) Max. Bottom of Pay	Avg. Thickness Pay (Ft.)	Type of Structure
ENGLAND:								
Lancashire:								
Formby	37	Keuper Waterstones	Sand Shaley Clay	Triassic Triassic	80	250	20	Faulted Monocline
Nottinghamshire:								
Caunton	23.9-31.1	U. Grit M. Grit	Sandstone	Upper Carboniferous	2170	2300	12	Dome with faulting
Duke's Wood	32.5-33.6	B. Sandstone Rough Rock Longshaw Grit Chatsworth Grit L. Carboniferous	Sandstone Limestone	Upper and Lower Carboniferous	1800 2500	2270 2640	20 70 20 60	Dome with faulting.
Eakring	34.4-37.6	B. Sandstone Rough Rock Longshaw Grit Chatsworth Grit Kinderscout Grit	Sandstone	Upper Carboniferous	1780	2260	10 60 20 100 40	Dome with faulting.
Kelham Hills	27.1-29.3	U. Grit L. Grit	Sand-Stone	Upper Carboniferous	2050	2280	40 30	Dome with faulting.
SCOTLAND:								
Midlothian:								
Dalkeith	39.6	.....	Sandstone	Lower Carboniferous	1728	1760	..	Anticline

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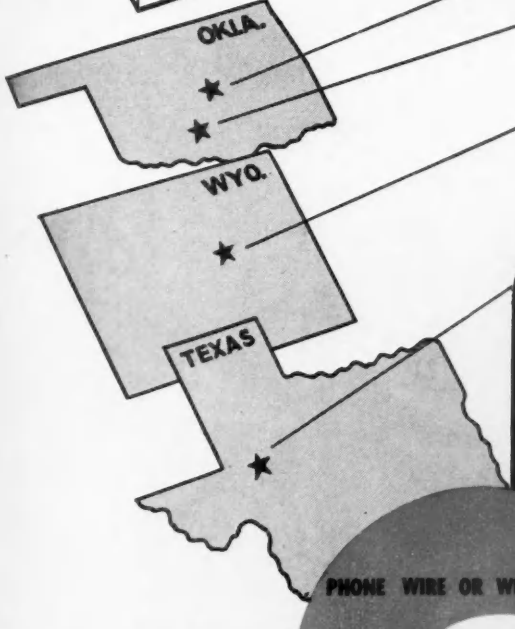

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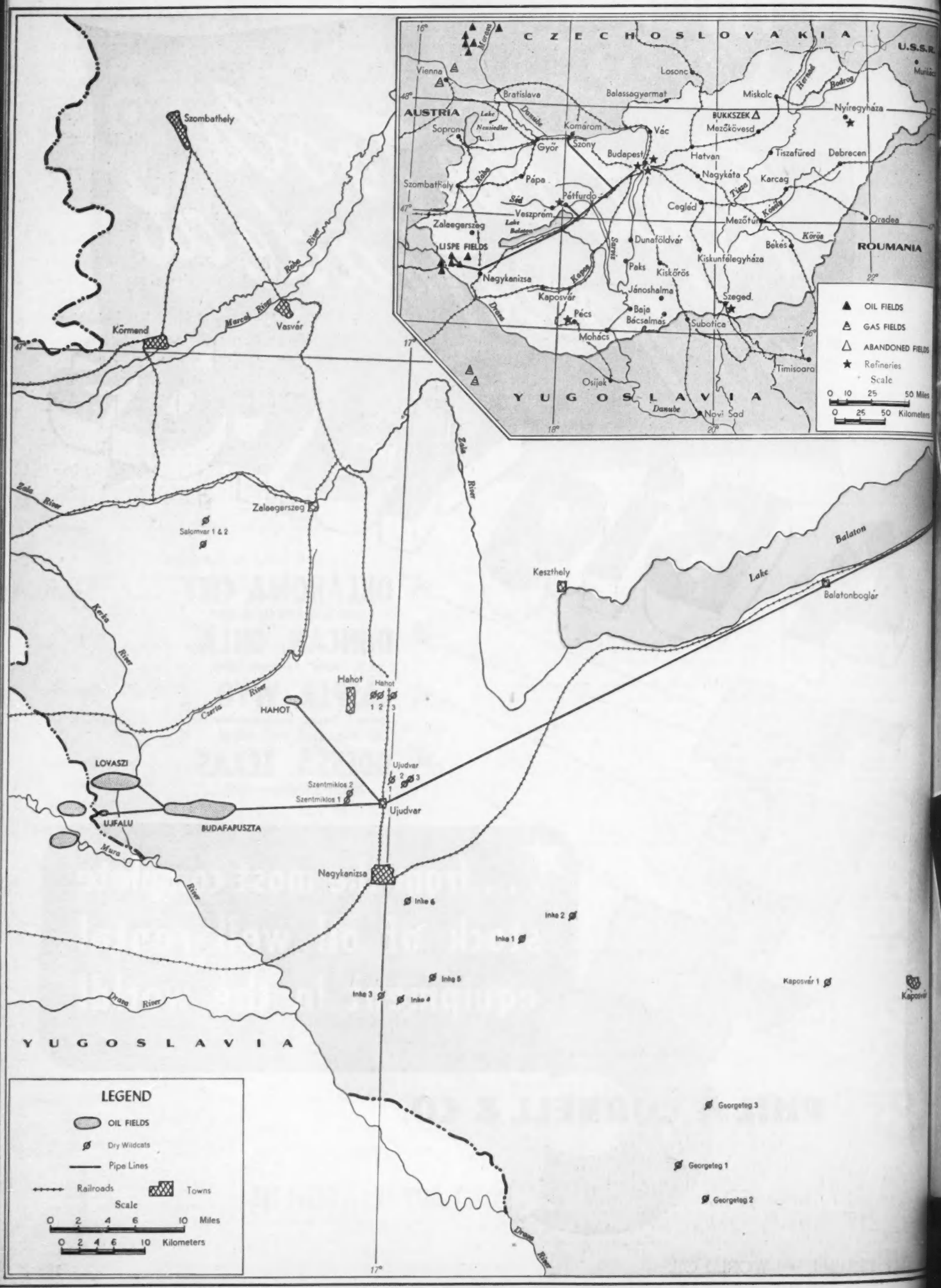
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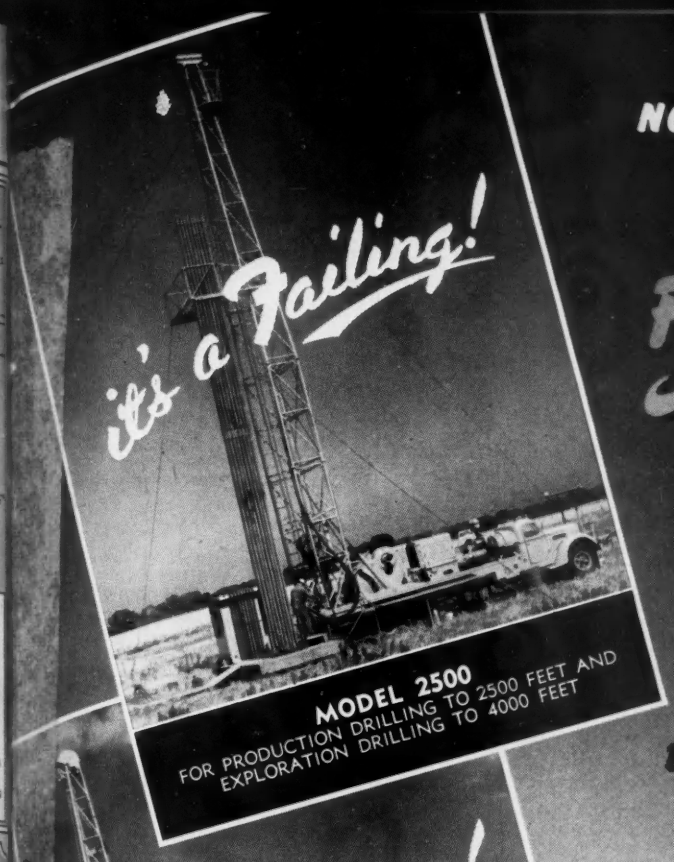

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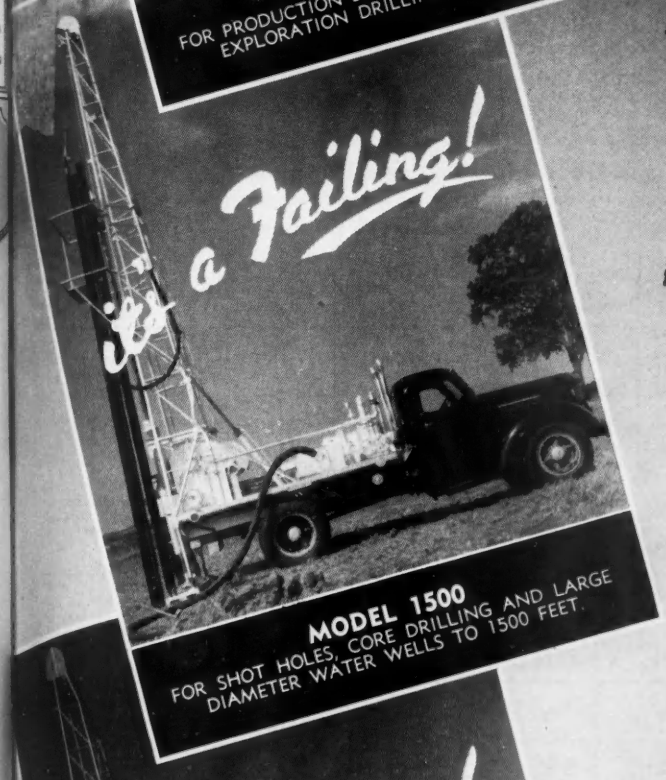

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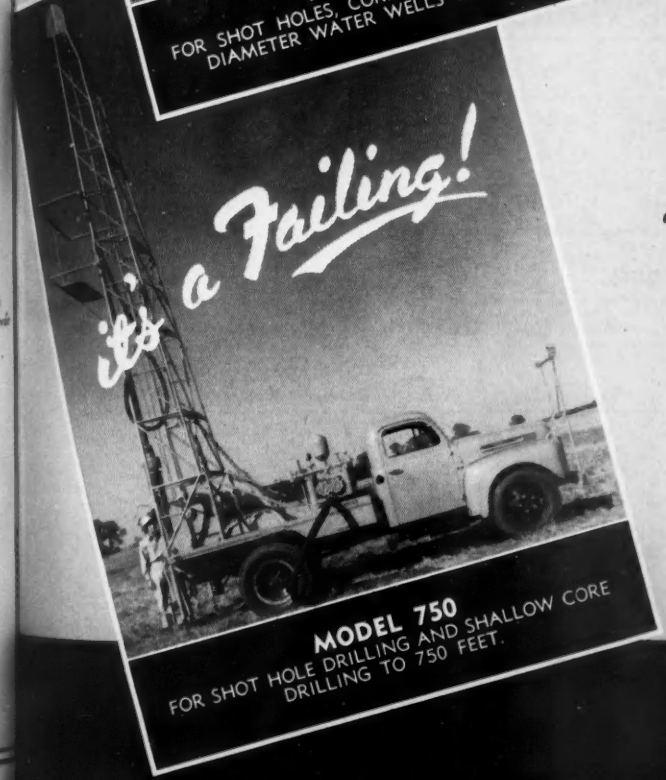

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HUNGARY

DESPITE a slight increase in development drilling, coupled with the efforts of the Government to maintain production at a high level, Hungary's crude oil production slumped during 1948 to 3,581,000 barrels, a drop of 749,000 barrels, or 17 percent below the 1947 output. Since Hungary's seizure of the properties of the Hungarian American Oil Company (MAORT) last September, most detailed information regarding the country's oil activities have been rigidly suppressed, but there seems little doubt that production will continue to decline in the face of the inefficient operating rates ordered by the Russian officials. The representatives of the Hungarian industry have asked the Soviets for new oilfield equipment to help bolster the sagging production, but there is little hope that any will be supplied. Although seven rigs are maintained in operation, they are known to be old and in need of replacement.

Meanwhile the greater part of the development activity has been concentrated in the Lovaszi field where 9 oil wells were completed during 1948. Lovaszi accounted for 60 percent of the country's output of oil, but completion of the new producers failed to halt a decline of 17 percent, or the same rate as the drop in total production.

Exploratory work included drilling 6 wells in the neighborhood of the group of producing fields, all of which were dry with the exception of one just off the Hahot structure which flowed 35 barrels a day on initial tests, and a wet-gas producer in the northwest flank area at Hahot. Geophysical work and wildcat drilling was also carried on by the Hungarian Soviet Oil Company, which drilled three dry holes in the Great Hungarian Plains region.

The American interests confiscated in September included all of those owned by the Magyar Amerikai Olajipari Resvenytarsasag, a subsidiary of The Standard Oil Company (N.J.) and represented all of the nation's production with the exception of an insignificant amount yielded by the State-owned field of Bukkszek. The Hungarian Government charged sabotage by the American operators and arrested the company managers, both of whom were later deported from the country. A protest registered by the U. S. State Department has failed to bring satisfaction.

Refineries in Hungary

COMPANY	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Type of Refinery	Operating Status
Fanto Associated Hungarian Oil Co., Ltd.	Budapest	1100	None	Skim-Lube	Operating
Maygar Hydrobenzin Részvénytársaság	Pétfürdö	1200	350	Skim-Cracking	Operating
Maygar Pet.-Dr. Freund	Csepel (Budapest)	1100	None	Skim-Lube	Operating
Nyiregyhaza Petroleumgyar Részvénytársasság	Nyíregyháza	300	None	Skim-Lube	Operating
Shell Koolaj Részvénytársaság	Csepel (Budapest)	3850	None	Skim-Lube	Operating
Soviet-Hungarian Oil Co.	Pécs	5500	....	.....	Building
Szoregi Petroleumfabrik	Szöreg (Szeged)	420	None	Skim-Wax	Operating
Vacuum Oil Co. Részvénytársaság	Almásfüzitö Szöny)	3800	None	Lube-Wax-Asphalt	Operating

Engineering and Geological Data on Hungary Fields

COUNTY AND FIELD	Est. Proved Area (Acres)	Gravity Oil (A.P.I.)	Name	Kind	Age	Depth (Ft.) Min. to Top of Pay	Depth (Ft.) Max. Depth Wells	Avg. Thickness of Pay (Ft.)	Type of Structure
Heves:									
Bukkszek	....	....	.....	Tuff	Oligocene	250	4462	..	Anticline
Zala:									
Budafapuszta	2330	42.5	Le. Pannonian	Sand	L. Pliocene	3500	5786	39	Anticline
Hahot	145	31.3	.....	Limestone	L. Pliocene-Miocene	4675	4770	98	Buried Hill
Lovaszi	2550	40	Lovaszi	Sand	L. Pliocene	3950	5139	75	Dome
Ujfalu	86	....	.....	Sand	Pliocene	2300	5790	22	Dome

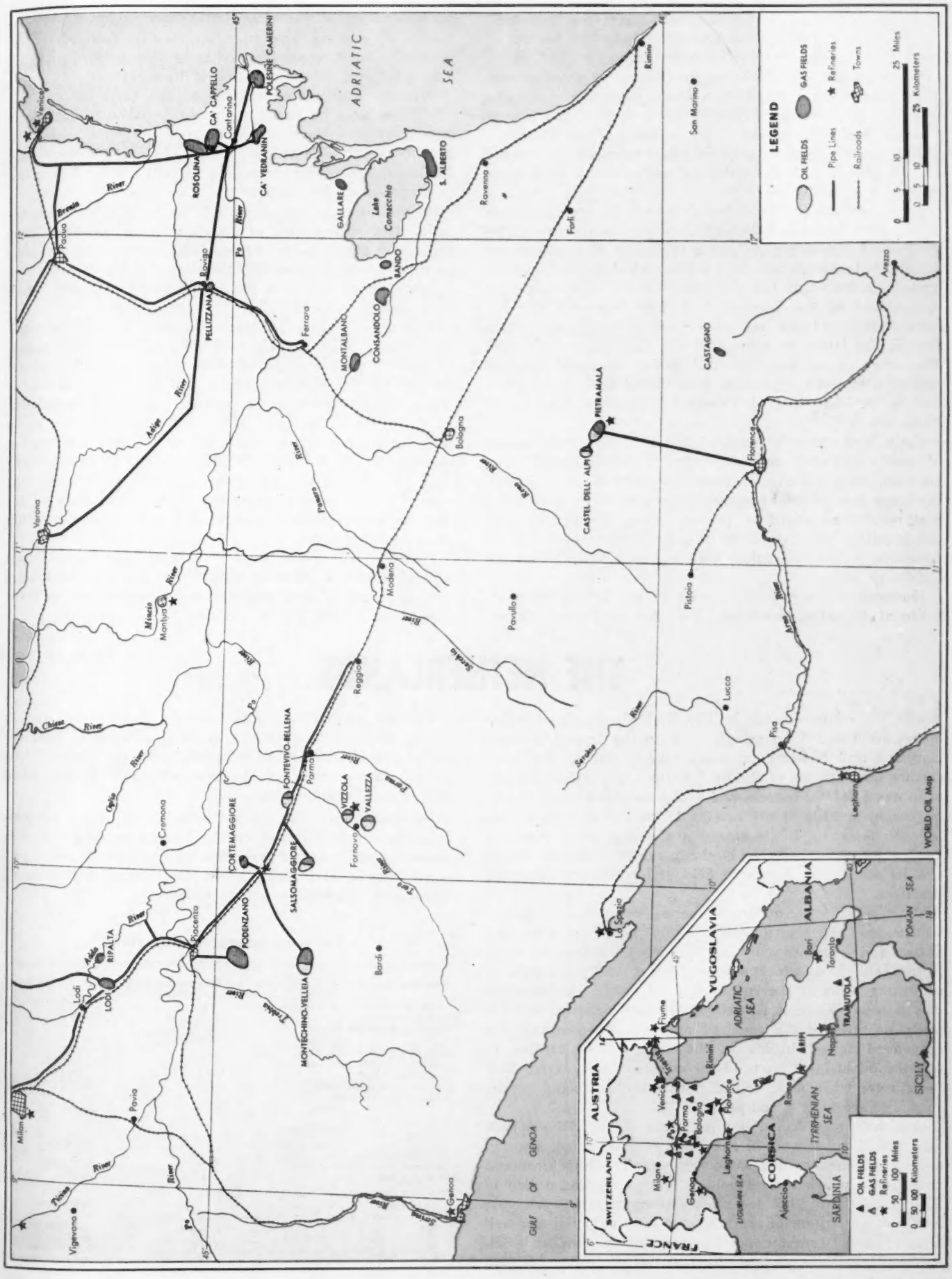
Oil Production and Producing Wells in Hungary

COUNTY and FIELD	Year of Discovery	PRODUCING OIL WELLS END OF 1948 Flowing	Artificial Lift	Total Producing	CRUDE OIL PRODUCTION (Barrels) Daily At End 1948	Year 1947	Year 1948	Cumulative Through 1948
Haves:								
Bukkszek	1937	n.a.	n.a.	n.a.	n.a.	1,065	1,000	87,199
Zala:								
Budafapuszta	1937	34	42	76	2,780	1,235,554	1,097,000	16,970,808
Hahot	1942	5	3	8	895	468,660	337,000	3,155,034
Lovaszi	1940	67	31	98	5,820	2,625,151	2,146,000	22,277,417
Ujfalu	1941	Shut In	..	..	....	.....	.....	13,362
Total	....	106	76	182	9,495	4,330,430	3,581,000	42,503,820

Drilling in Hungary

STATE and FIELDS	WELLS COMPLETED IN 1947 Oil	Gas	Dry	TOTAL Wells	Footage	WELLS COMPLETED IN 1948 Oil	Gas	Dry	TOTAL Wells	Footage	WELLS DRILLING AND SHUT DOWN AT END OF 1948 Drilling	SD	Total
Billiar:													
Wildcats	..	..	1	1	3,300	..	..	..	..	.....	..	..	..
Great Plains:													
Wildcats	..	..	2	2	1,700	..	..	2	2	n.a.	1	..	1
Somogy:													
Wildcats	..	..	2	2	7,115	..	..	1	1	n.a.	1	..	1
Zala:													
Budafapuszta	..	..	..	..	.....	4	..	..	4	18,208	..	..	..
Hahot	..	..	..	..	.....	2	3	1	6	28,692	2	..	2
Lovaszi	11	..	..	11	49,753	9	..	..	9	42,251	2	..	2
Wildcats	..	6	2	8	44,525	..	1	5	6	n.a.	1	..	1
Total	11	6	7	24	106,383	15	4	9	28	89,151	7	..	7

ITALY


LEGEND
OIL FIELDS
GAS FIELDS
Pipe Lines
Refineries
Railroads
Towns
25 Miles
25 Kilometers
ADRIATIC SEA
TYRRHENIAN SEA
IONIAN SEA
LIGURIAN SEA
GULF OF GENOA
ROSOLINA
CA' CAPPELLO
CA' VEDRANIN
POLESINE CAMERINI
S. ALBERTO
BANDO
PELLIZZANA
MONTALBANO
CONSANDOLO
GALLARE
CASTAGNO
CASTEL DELL' ALPI
PIETRAMALA
PONTEVICO
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SARDINIA
SICILY
OIL FIELDS
GAS FIELDS
Refineries
Miles
Kilometers
WORLD OIL Map

ITALY

ITALY, despite efforts to find and develop new sources of crude oil production, has shown another drop in output. At the end of 1948 it was producing only 177 barrels of crude daily, compared with 220 barrels a day in 1947. However, as partial compensation for failure to develop new oil resources, there has been a sharp expansion in its gas industry. With many billions of cubic feet of gas known to exist in the upper and lower portions of the Po River Valley there is now a concerted effort to make the natural gas available to as many industrial and domestic consuming centers as possible.

Of the estimated 64,650 barrels of oil produced in Italy during 1948, 34,664 barrels, or 53.5 percent was produced by the Società Petrolifera Italiana, a subsidiary of the Standard Società Italo-Americana del Petrolio, which is in turn controlled by Standard Oil Company (N.J.). The remainder is produced by the Società Idrocarburi Nazionali, the Società Petroli d'Italia and the Azienda Generale Italiana Petroli, the latter an agency of the Government. No new discoveries of oil were recorded during the year with the exception of some condensate wells found at Cortemaggiore by the A.G.I.P. and at Consandolo by the Idrocarburi Nazionali.

Early in the year it appeared that a considerable amount of new exploratory and development drilling would take place in Italy, but this program slowed down considerably the latter part of the year, chiefly because of the possibility that regulations might be passed placing the operation of the industry into the hands of the Government-sponsored company. A bill to legalize such a step is now before the legislative body.

However, some new discoveries of gas production were made at Ripalta, north of Lodi, and at Cortemaggiore, southeast of Piacenza, both the result of seismic geophysical surveys. Both of these new areas are within fairly easy access of existing pipe line transmission facilities. There have also been recent discoveries of gas production in the Castagno area, in the province of Florence.

Whereas little more than a year ago there were a relatively few lines by which gas could be taken to heavy consuming centers, there is now a rapidly growing network of lines to supply gas to every large town in northern Italy. During the past year more than 4.6 billion cubic feet of gas were produced and used.

At the same time progress is being made toward rehabilitation and enlargement of Italy's refining industry. There are now 9 plants producing full lines of products, and some of them are in process of enlargement. Currently the total throughput capacity is in the neighborhood of 35,000 barrels daily.

Several large-scale refinery projects are in the early stages, including a plant capable of handling 10,000 barrels daily to be built at Trecate in northwestern Italy by a company formed by the Caltex interests and the Fiat company of Turin. This plant is to be connected with a terminal port at Vado Ligure by a pipe line. An Italian subsidiary of the Shell Group has applied for a permit to build a refinery at Apuania, north of La Spezia, with capacity of 38,000 barrels daily. The Standard Oil Company (N.J.) interests have started the modernization of the refineries at Leghorn and Bari to allow increased output and a more complete line of specialty products.

There is also a new refinery to be built at Porto Cugno, a naval base near Augusta in Sicily. At this site the refinery will make use of large underground storage facilities previously built for the Italian navy.

THE NETHERLANDS

CRUDE oil production in The Netherlands, all of which comes from the Schoonebeek field on the border between Germany and Holland, increased rapidly during 1948 with further development of the field. Output of the field for the year was 3,444,000 barrels, and at the end of the year it was producing steadily at the rate of 11,360 barrels a day. This is not likely to be increased materially since reservoir studies indicate that this is the maximum amount which can be withdrawn from the field under efficient operating practices.

With relief from materials shortages the N. V. Nederlandse Aardolie Maatschappij, jointly owned by the Shell Group and Standard Oil Company (N.J.) drilled 41 wells in the field, 40 of which were producers, and there were 77 producing wells at the end of the year, only one of which was flowing. Since it is well within the capacity of these wells to produce the required amount, the company has suspended active drilling in the field, and is turning to exploration in other parts of the county. Three exploratory wells were wells were drilled during the year, and results this far have been encouraging.

One well was drilled 9 miles west of the Schoonebeek field and 2 miles west of the town of Coevorden, opening a deep gas area on the same east-west trending structural uplift upon which the oil field is located. It was drilled to a total depth of 9137 feet, being completed between 9056 feet and the bottom of the hole as a high-potential gas well from fractured limestone of Permian age. No further development has taken place pending arrival of heavier drilling equipment.

Another wildcat near the town of Delft is reported as having found good showings of oil at a depth of 1800 feet, but the well was junked without being successfully completed. At the close of the year another test was being drilled in the same area.

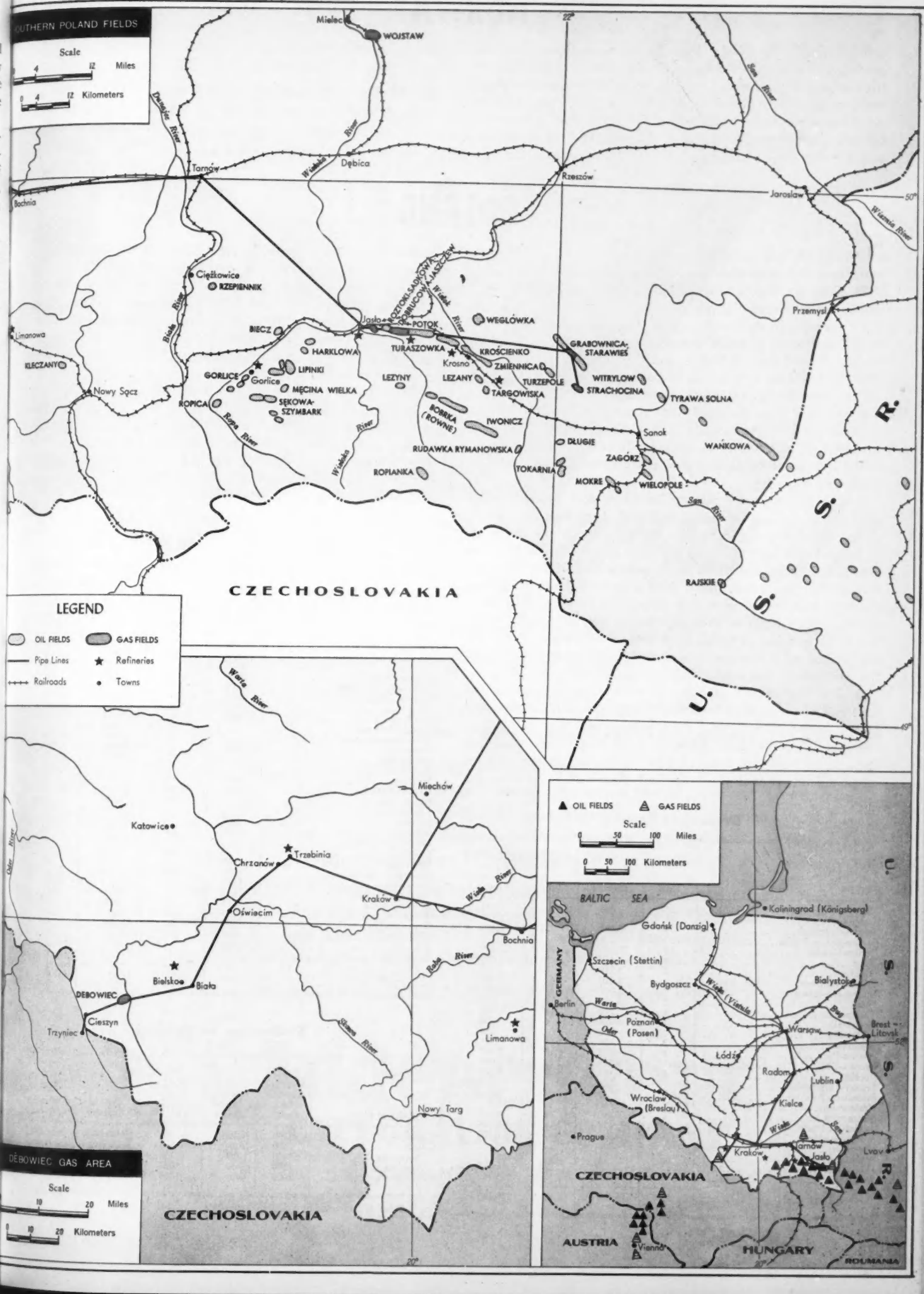
In still another area, some 9 miles north of the Schoonebeek Field, a well drilled on the Emmen anticline failed to produce, but rendered valuable information. It reportedly cored Liassic formations below the Albian unconformity, missing the Upper Cretaceous formations.

Data on Schoonebeek Field

Operating Company—N. V. Nederlandse Aardolie Maatschappij (50% S. O. (New Jersey), (50% N. V. De Bataafsche Petroleum Maatschappij)

Year of Discovery	1943
Producing Wells, Oil, Flowing	1
Pumping	76
Daily Production end of 1948	11,360
Production in 1947	1,478,200
Production in 1948	3,444,000
Cumulative to End of 1948	5,411,700
Wells Drilled 1948—Oil	40
Gas	None
Dry	1
Total Wells	41
Footage Drilled	118,720
Field Wells Drilling—End of 1948	1
Estimated Proven Area of Field	2700 Acres
Gravity of Oil (A.P.I.)	24.8
Producing Formation:	
Local Name	Valanginian
Kind	Sand
Age	L. Cretaceous
Minimum Depth to Top of Pay	2500
Maximum Depth to Bottom of Pay	2650
Average Thickness of Pay	80
Type of Structure	Anticline

POLAND—Southern Fields



NORWAY

NORWAY, one of the few European countries with no crude oil production of its own, is also one of the few countries in that region with virtually no refining capacity of its own; consequently all of its petroleum requirements are derived from products imported in finished form. One small refining plant, demolished during the war, was reconstructed, and was reported as having gone on stream during the past year. However, records available to us fail to list crude oil among imports. During the year, 9,704,000 barrels of petroleum products, including asphalt and specialty products were brought into the country, of which 7,367,000 barrels were fuel oil and diesel fuel. Industrial users are showing an increased preference for liquid petroleum over solid fuels.

POLAND

STATISTICAL information on the progress of Poland's petroleum industry was not available past the middle of 1948. Such as was available indicated that there has been a substantial increase in the number of wells drilled, and a slight increase in the volume of crude oil production. The industry in Poland is under the direction of the Central Board for the Liquid Fuel industry, and this agency is making an effort to build up production of both oil and gas.

Few new producing areas have been found in the past several years, with the result that very little flush production is being obtained from wells drilled. The increase in drilling is apparently successful in keeping down decline in the old fields, but is not furnishing any great amount of build-up in producing capacity.

During the first six months of 1948 total production of crude oil in Poland amounted to 493,962 barrels, a rate which would indicate a production of 989,000 barrels for the year, or an increase of a little more than 4 percent over 1947 output. Unofficial information since the middle of the year indicates that there may have been a definite increase during the later part of the year, due principally to success in completing better wells in the Grabownica area, a region which has for a number of years been one of the better producers left in Poland following loss of the Carpathian fields to the Soviets during the war.

Several discoveries of new oil were reported during the first half of the year. A well at Folusz, near Gorlice was completed during March, and went into production just before the middle of the year. A rig was working in the area, but the second well had not yet been completed at the time of latest report. It was also reported that new wells near the village of Garby in the Kraków administrative district were showing good production. Two of the wells in this region tested for daily potentials of 120 and 189 barrels respectively.

During the past year a total of 85 rigs were in operation, 24 of which were on wildcats, 10 on extensions to proven areas, and 31 were used in development drilling. The remainder of the equipment is being used in deepening and other types of special work.

A total of 69 wells were completed during the first half of 1948, far in advance of the drilling rate during 1947, when only 95 wells were completed during the entire year, and it is apparent that there is a trend toward deeper drilling since total footage drilled during 1947 was 106,489 feet, whereas in drilling 69 wells during the first half of 1948 a total of 100,220 feet of hole was completed.

Drilling in Poland

FIELDS	WELLS COMPLETED IN 1947		WELLS COMPLETED JAN-JUNE 1948	
	Total	Footage	Total	Footage
Klęczany-Starawieś	..	965	..	1,027
Szalowa	..	....	..	1,637
Sękowa-Szymbark	5	5,062	2	1,486
Gorlice-Ropica Polska	..	....	..	....
Gorlice-Lipinki	34	27,651	9	12,500
Biecz	3	6,470	4	2,290
Harklowa	2	1,769	3	1,851
Rostoki-Sadkowa	..	2,920	1	3,087
Dobrucowa-Jaszczew	2	5,367	..	1,093
Potok	1	1,988	1	768
Turaszówka	1	111	11	640
Krościenko	1	5,328	4	5,039
Bratkowka	..	502	..	584
Węglówka	2	1,296	..	171
Iwonicz-Płd	4	3,405	5	2,287
Iwonicz-Płn	..	3,248	..	988
Bóbrka	6	9,117	4	9,242
Leżany-Targowiska	..	548	..	397
Zmiennica-Turzepole	5	7,392	3	4,944
Grabownica	23	14,626	13	12,267
Strachocina	1	6,240	2	4,606
Zagórz-Wielopole	..	837	1	4,193
Mokre-Rajskie	3	1,627	2	1,178
Witrytów	..	....	..	....
Wańkowa	..	....	..	....
Folusz	..	....	1	1,237
Wildcats	2	....	3	26,709
Total	95	106,489	69	100,220

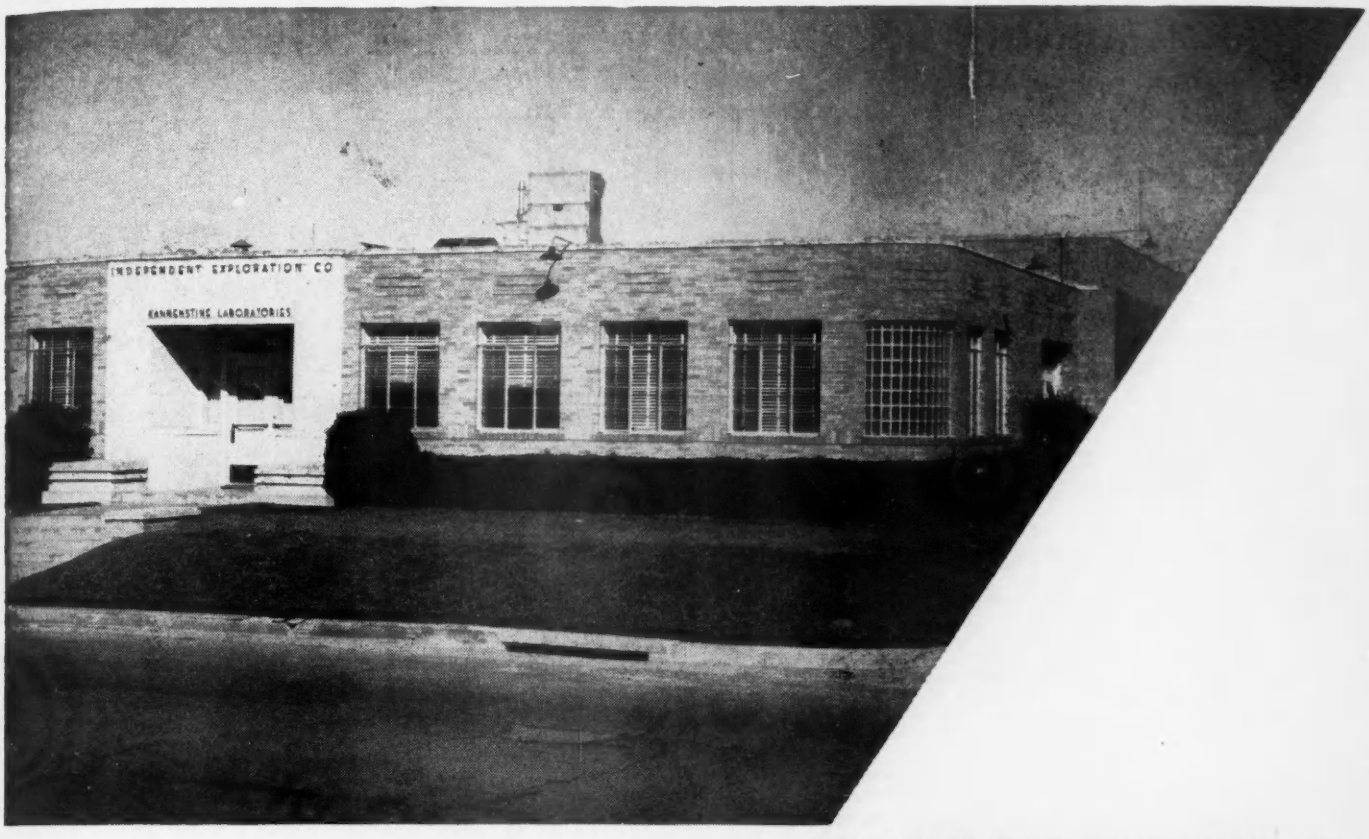
Oil Production and Producing Wells in Poland

FIELDS	Year of Discovery	Producing Oil Wells End of June, 1948	CRUDE OIL PRODUCTION (Barrels)	
			Year 1947	Jan.-June 1948
Klęczany-Strawieś	1856	10	304	193
Sękowa-Szymbark	1875	78	6,672	3,998
Rzepiennik	1930	3	677	345
Męcina Wielka	1909	33	1,652	947
Gorlice-Ropica Polska	1931	110	34,755	18,494
Gorlice-Lipinki	1865	789	192,073	99,380
Biecz	1897	64	25,758	13,475
Harklowa	1870	164	42,788	21,660
Rostoki-Sadkowa	....	7	9,085	4,108
Dobrucowa-Jaszczew	....	23	28,662	13,145
Potok	1891	49	37,341	18,946
Turaszówka	....	61	95,454	55,477
Krościenko	....	49	23,988	13,391
Węglówka	1887	83	17,681	8,637
Iwonicz-Płd	1890	84	33,311	19,569
Iwonicz-Płn	....	30	1,549	643
Leżyny	....	2	829	471
Bóbrka	1858	115	67,014	36,677
Ropianka	1868	13	769	220
Łężany-Targowiska	....	1	349	95
Długie	....	11	366	158
Rudawka Rym.-Tokarnia	1889	18	1,433	629
Zmiennica-Turzepole	1896	63	43,875	21,639
Grabownica	1896	97	122,900	62,986
Zagórz-Wielopole	1885	11	10,198	4,410
Mokre-Rajskie	1914	59	17,475	7,395
Witrytów	1880	24	2,350	1,148
Tyrawa Solna	1897	31	14,362	8,462
Wańkowa	1885	387	117,157	54,585
Folusz	1948	1	....	2,679
Bratkowka	....	....	6	....
Total	.....	2,468	950,833	493,962

Refineries of Poland

Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Daily Crude Runs End of 1947 (Bbls.)	Type of Refinery	Operating Status
Jedlicze	1200	None	895	Skim-Lube	Operating
Jasło	1500	None	858	Skim-Lube	Operating
Czechowice	1600	300	118	S-L-Wax	Operating
Trzebinia	1500	None	585	Skim-Lube	Operating
Glinnik Mariompolski	1500	None	1362	Skim	Operating

Note: All operated by Polish Oil Industry.



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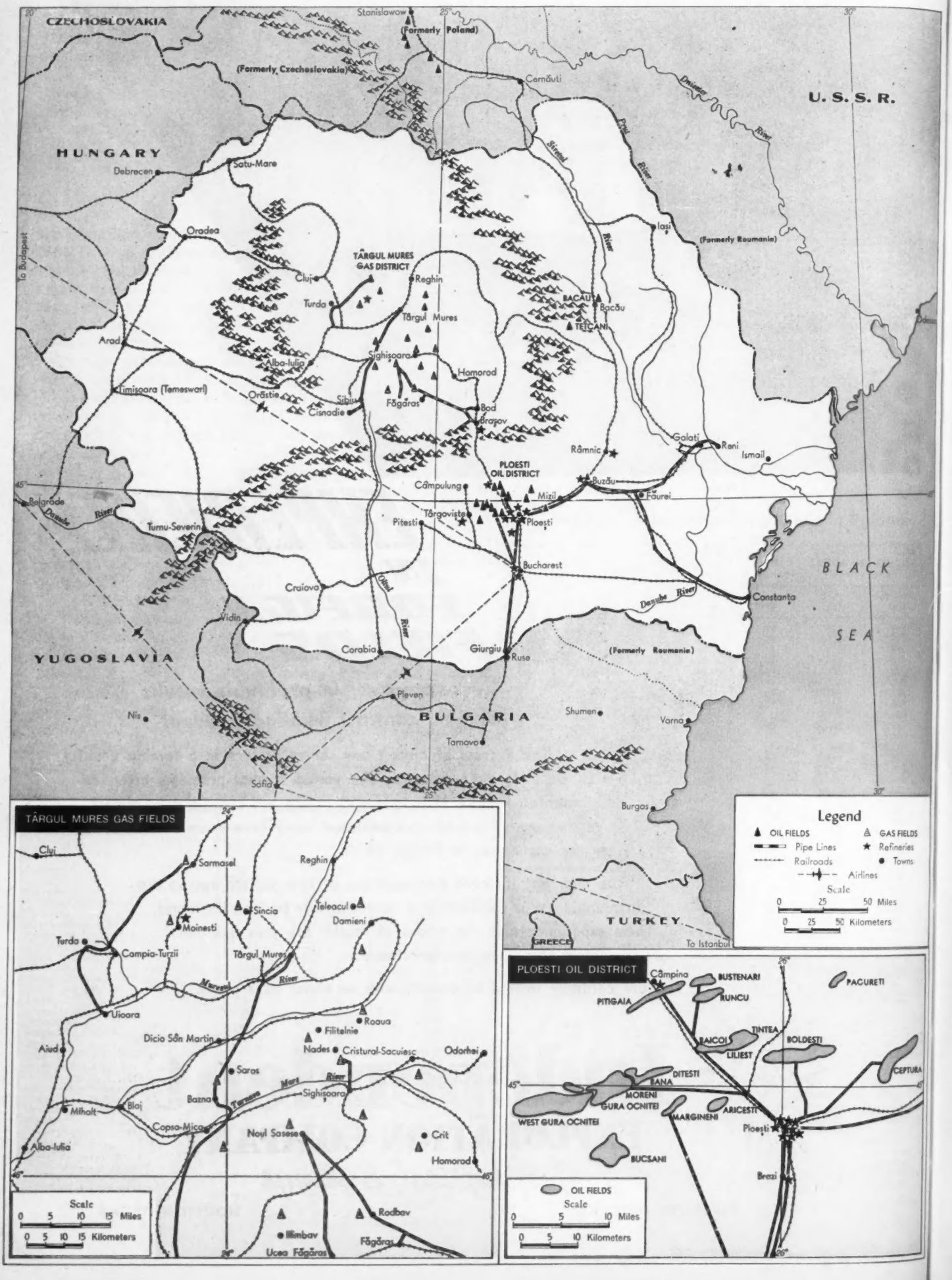
ROUMANIA—Ploesti and Targul Mures Fields



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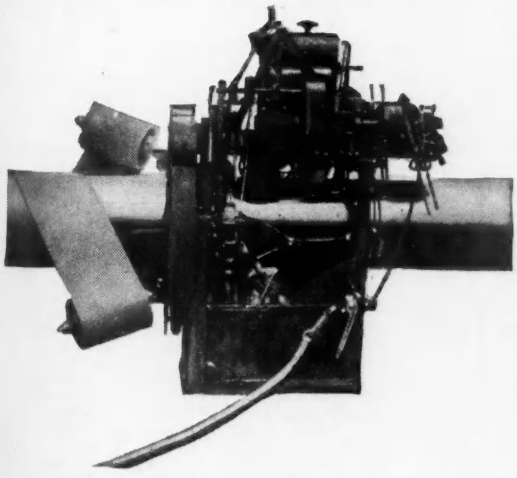

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PORTUGAL

PORTUGAL, which has never developed any indigenous sources of crude oil production, is now carrying on some geological work with a view to locating favorable prospects for drilling. The most favorable areas are rather small and are located 25 miles northwest of Lisbon and in the extreme south. A number of shallow tests have been drilled since the latter part of 1947, deepest being about 1360 feet, and it has been reported that some showings have been found, although not enough to warrant full-time development. Three geological parties have been working the basin areas throughout the year, under the direction of the Companhia Portuguesa do Petróleo. Best showings have been found near Torres Vedras.

The refining capacity of Portugal is concentrated in one plant built just before the war, originally as a unit to handle 7000 barrels of crude oil daily, but it has since started construction to bring total ultimate capacity to more than 10,000 barrels a day. It contracted last year with the Venezuelan Government for delivery of 10,000 barrels of crude daily. The plant was constructed and operated by the Sociedade Anonima Concessionaria da Refinacão do Petróleos em Portugal (SACOR), and is owned one-third by the State.

ROUMANIA

ROUMANIA in 1948 joined the list of countries to clamp down censorship on all industry activities. The oil industry was nationalized in June and publication of the official statistical organs were discontinued. At the same time the Association of Roumanian Oil Industrialists, a statistics-supplying agency, was dissolved.

Nevertheless enough information has been available from Roumania to indicate a slight gain over the official figures for 1947. On the basis of complete figures for the first 9 months of the year, and estimates for the remainder, it appears that production may have reached a total of 29,500,000 barrels during 1948, to compare with a 1947 total of 28,772,634 barrels. Cumulative production has reached approximately 1,202,586,000 barrels.

Following the nationalization, the Communist-dominated Roumanian Government set a goal of 33 million barrels as the amount of production desired from Roumanian fields during 1948. None of the available figures point to that goal's being realized. There have been claims of sharp production gains after the nationalization, but such claims are unsupported by figures.

In an effort to reach peak production rates, a goal of 1,115,500 feet of hole was set up as a drilling program, or roughly double the revised figures for 1947 drilling. In reaching this goal it was desired that 210 wells be drilled of which 60 were to be wildcats and 150 field development wells. The number of wells actually drilled is still withheld, although claims have been made of an increase of 150 percent since nationalization. It has also been reported that 1,094,000 feet of hole was actually drilled, but observers in this country are doubtful that the overall goal for number of wells to be drilled was even approximated.

About 40 percent of Roumania's production is being used locally, and 60 percent exported to Russia and its satellite countries. During 1947 approximately 95 percent of total exports, amounting to 14,066,000 barrels, went to Russia as war reparations.

It was reported that a new oil field was found during the year near Carei in Transylvania, where oil sand was found at a depth of 4200 feet. A discovery of natural gas was reported in northern Moldavia where drilling was recently started with Russian-supplied equipment.

The Economic Plan for 1949 states that exploratory drilling is to exceed 1948 wildcatting by 48.2 percent, and that the output of crude oil is to rise at the same rate as during the last half of 1948.

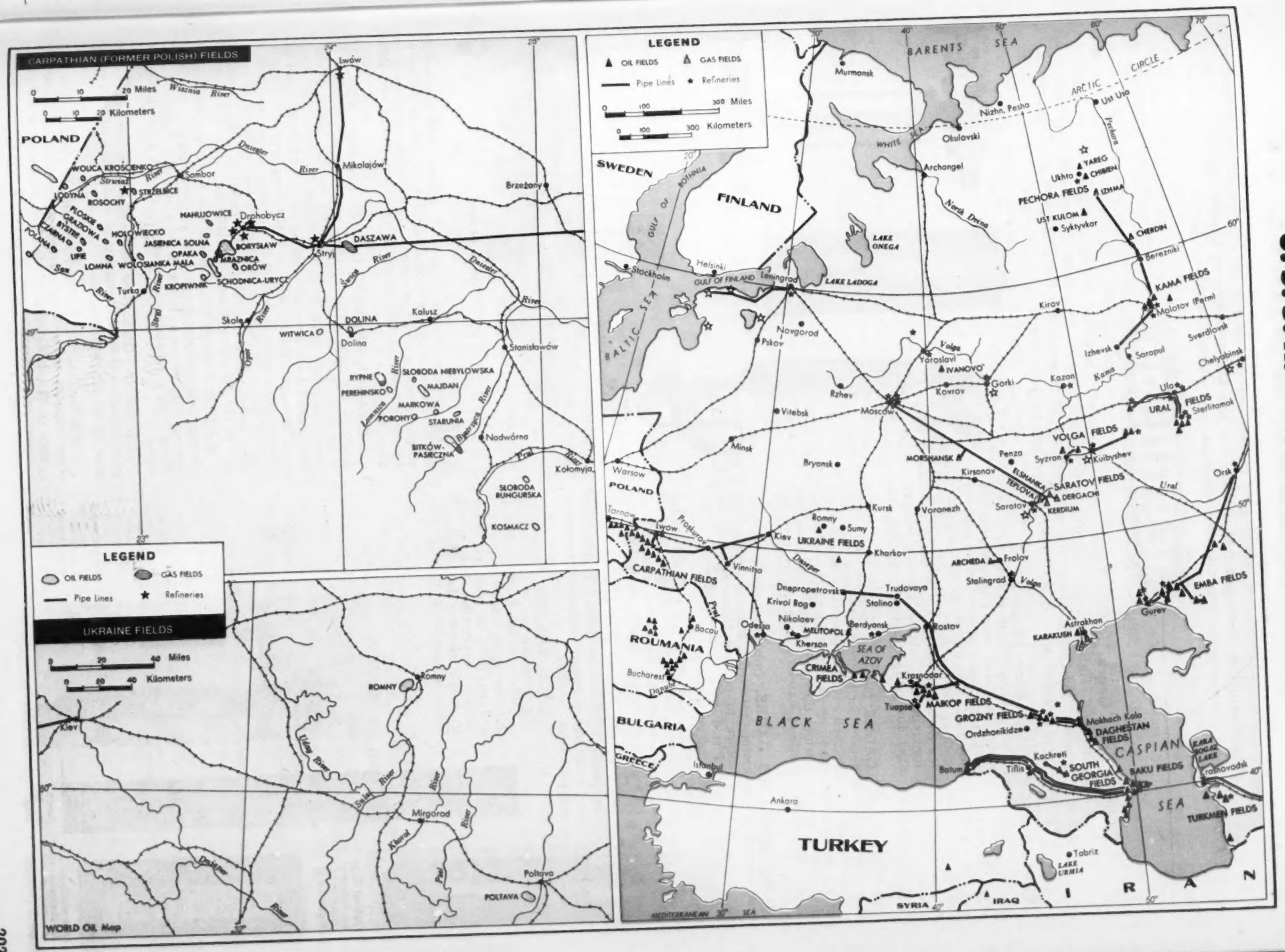
Geological Data on Roumanian Fields

Province and Field	Gravity of Oil	PRODUCING FORMATION		
		Local Name	Kind	Geologic Age
Prahova:				
Moreni-Gura Ocnitei	33	Dacic, Meotic, Helvetian	Sand	Pliocene, Miocene
Filipesti de Padura	43	Meotic	Sand	Pliocene
Margineni	39	Meotic, Sarmatian	Sand	Miocene
Aricesti	35	Meotic	Sand	Pliocene
Campina	41	Meotic	Sand	Pliocene
Pitigaia-Dragauneasa	36	Helvetian	Sand	Miocene
Bustanari-Runcu	42	Meotic, Helvetian, Oligocene	Sand	Pliocene, Miocene Oligocene
Floresti	..	Meotic	Sand	Pliocene
Băicoi-Tintea-Liliesti	39	Dacic, Meotic	Sand	Pliocene
Boldesti-Păulesti	37	Meotic	Sand	Pliocene
Scaiosi	40	Meotic	Sand	Pliocene
Malaesti-Magurale	32	Meotic	Sand	Pliocene
Copaceni	41	Meotic	Sand	Pliocene
Matita-Atarnati	42	Meotic	Sand	Pliocene
Ceptura	34	Meotic	Sand	Pliocene
Zemes-Tazlau	43	Oligocene	Sand	Oligocene
Stanesti-Solorti	43	Oligocene	Sand	Oligocene
Tescausi	43	Helvetian	Sand	Miocene
Dambovita:				
Mahl-Rosu	37	Sarmatian	Sand	Miocene
Bucsani	38	Meotic	Sand	Pliocene
Doicesti	39	Meotic	Sand	Pliocene
Glodeni	38	Meotic	Sand	Pliocene
Băzau:				
Arbanasi	39	Meotic	Sand	Pliocene
Berca	..	Meotic	Sand	Pliocene
Sarata Monteoru	38	Meotic	Sand	Pliocene
Bacău:				
Moinesti	43	Meotic, Oligocene, Eocene	Sand	Pliocene, Oligocene, Eocene

Data on Refineries in Roumania

COMPANY	Location of Plant	Crude Charging Capacity (Barrels Daily)	Cracking Capacity (Barrels Daily)	Type of Refinery	Operating Status
Astra Română S.A. (Dutch-Shell)	Ploesti-Sud	25,000	12,000	Complete	Operating
Colombia Société Franco-Rumanine de Petróle	Ploesti-Sud	17,000	3,300	Skim-Crk.	Operating
Concordia Société Anonyme Rumaine pour l'Industrie du Petróle	Ploesti-Nord	25,000	4,700	Skim-Crk.	Operating
Creditul Miniere S.A. Rumaine	Brazi	10,600	3,500	Complete	Operating
Dacia Romano Pet. Synd. Ltd.	Ploesti-Nord	2,650	.....	Skim.	Operating
"Petrol Block" Société Anonima Română	Ploesti	11,600	4,700	Skim.-Crk.	Operating
"Photogen" Rafineria de Petrol, S.A. (Socony-Vacuum)	Ploesti-Nord	3,500	.....	Skim.	Operating
"Unirea" Societate Anonima Romanada Petrole (Phoenix)	Ploesti	12,800	3,250	Skim.-Crk.	Operating
Română Americană S.A. (Std. of Jersey)	Ploesti	24,200	7,900	Skim.-Crk.	Operating
Steaua Română S.A.	Moinesti	7,000	.....	Skim.	Operating
	Câmpina	6,500	.....	Skim.	Operating
Intr. Niculescu Ciufu	Târgoviste	150	.....	Skim.	Operating
B. Blum	Margineni	300	.....	Skim.	Operating
Prahova (Petrolul Bucharest)	Bucharest	3,600	.....	Skim.	Operating
Xenia	Ploesti	4,500	.....	Skim.	Operating
Astramina	Ploesti	1,400	.....	Skim.	Operating
Est. Petrol	Ploesti	850	.....	Skim.	Operating
Reznov	Ploesti	300	.....	Skim.	Operating
David, Ciurea	Ploesti	100	.....	Skim.	Operating
Luceafarul	Ploesti	100	.....	Skim.	Operating
Revoil	Ploesti	300	.....	Skim.	Operating
Apollon Petrol	Ploesti	400	.....	Skim.	Operating
Petrocarbon	Ploesti	500	.....	Skim.	Operating
Major O. Pelin	Ploesti	100	.....	Skim.	Operating
Total	24 Plants	157,850	39,350	.....	.....

U.S.S.R.—Western European Fields



JERGUSON GAGE & VALVE CO.

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Representatives in Major Cities in U. S., Canada and Mexico, With Phones Listed Under Jerguson

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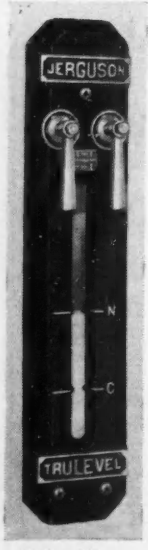
Liquid Level Gages: Reflex, Transparent, Tubular, Distance Reading, Heated, Cooled, Non-Frosting and High Pressure. **Liquid Level Gage Valves:** Standard, Offset and Jacketed. **Water Columns, Tri-Cocks, Gage Illuminators, Sight Glasses, Special Design Sight Glasses,** Retort Gages, Bombs, etc., made to fit individual requirements.

REFLEX GAGES (Liquid Shows Black). An easy-to-see, accurate liquid level reading gage. Liquid shows black with a sharp clear line showing the level, contrasted with bright, mirror-like appearance in empty space above. Covers made of heat treated forged alloy steel in high pressure groups; certified malleable iron castings or bar stock in low pressure group. Glasses of Pyrex with molded prisms. Available with polished end stems for replacing tubular glass. Complete range of standard sizes for pressures up to 3200 lbs. @ 100° F.

TRANSPARENT GAGES. Used for accurate liquid level reading where color, density, or interface of liquid must also be noted. Simple and rugged . . . will give long, satisfactory service on new equipment or as replacements for old-style tubular glass gages, for which they are available with polished end stems. Complete range of standard sizes for pressures up to 2000 lbs. @ 100° F.

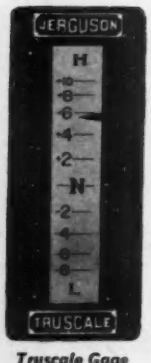
TUBULAR GLASS GAGES. Improvement on conventional design because better protected and has special stuffing box feature to prevent torsional stress on glass. Fitted with Jerguson Valves. Plate glass protectors available.



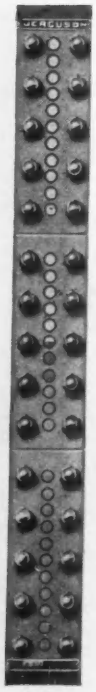
Trulevel Gage for Distance Reading of Water Level

SPECIAL GAGES. Heated and Cooled Gages (illustrated) for use where liquid must be kept hot or cool for accurate reading of level. Non-Frosting Gages. High Pressure Gages available for use under extremely high pressures; being tested up to 20,000 lbs. working pressure (illustrated below). Engineering and building of special gages and valves to meet specific problems.

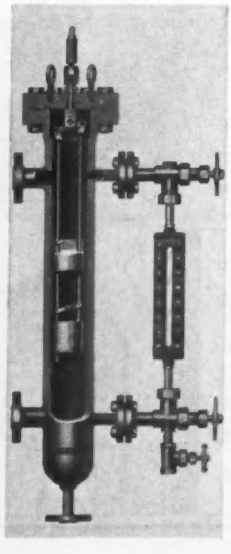
GAGE VALVES. Exceptionally complete line of gage valves . . . standard, offset and jacketed. All have union connection to vessel; available in plain or quick closing; convertible from plain to quick closing; ball pushers. Drain connections ¼", ⅜", or ½" at no extra charge. Variety of different tank connections on special order. Valve #64, illustrated, has union connection to gage; the gage can be turned at any desired angle and can be easily removed without removing valves or draining liquid from vessel.



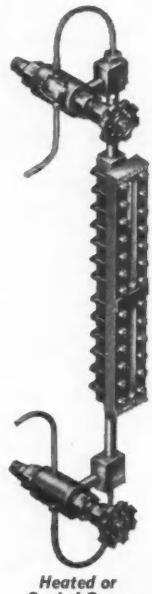
Truscale Gage For Distance Reading of Water Level



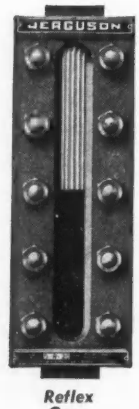
Series No. 50 Gage



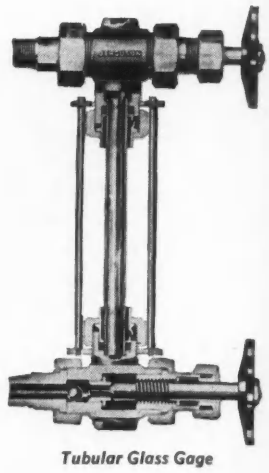
Water Column with 7-Hp Gage and A-37 Drain Valve



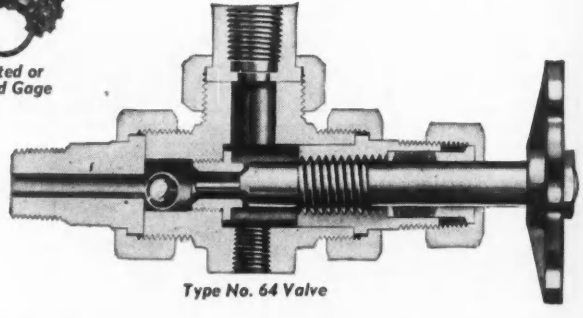
Heated or Cooled Gage



Reflex Gage



Tubular Glass Gage



Type No. 64 Valve

DISTANCE READING GAGES. Jerguson TRUSCALE Gage is dial type with mercury manometer; adjustable for 0 to 2500 lbs. W.S.P.; visible and audible alarm system; illuminated dial; so sensitive it is capable of registering change in the head of water with accuracy of ½ of 1% of scale reading. Jerguson TRULEVEL is hydrostatic type with inverted U-tube manometer; has built-in checking feature to check at will in operation both as to accuracy and sureness of operation; datum column is fully steam jacketed. No. 1, pressures to 900 lbs., No. 2, pressures to 1200 lbs.

WATER COLUMNS. Positive low water and high water alarms. Solid displacement type weights. Simple crankshaft mechanism. Shown at left with popular 7-HP Gage and A-37 Drain Valve. Available complete, as shown, or as individual units.

ILLUMINATORS. New wedge-light illumination assures even diffusion of light through gage glass. Available in explosion proof construction.

Ask for detailed Data Units on any Jerguson products, or write to us for engineering suggestions and assistance in the application of standard Jerguson gages and valves or the development of special gages and valves to meet your problems.

SPAIN

SPAIN'S program of prospecting for domestic sources of oil production, which started with the drilling of a wildcat in 1947 on the Oliana prospect, is gaining momentum.

The Oliana wildcat, drilled by Compañía Española de Petróleos Scientíficas Investigaciones, was abandoned during the year at a depth of 8200 feet. The company is owned half by Socony-Vacuum Oil Company and half by private Spanish capital. Following completion of the Oliana well the rig was moved to a location in northern Spain and another well was spudded on a location near Burgo de Osma.

The Compañía Española de Petróleo, S. A. (CAMPSA) a government company, has also been active, carrying on geological and geophysical work, and some drilling. One rig is now being operated on a prospect in the Zamanzas Valley where some showings of oil in Jurassic limestones have been found. Another rig is to be moved in to a prospect near Villanueva de Rampalay in the Province of Burgos.

In southwestern Spain some shallow drilling is being done near Chiclano de la Frontera, south of Cadiz, by the Empresa Adaro, a private-capital firm. Some fair showings of natural gas have been found at depths above 5000 feet.

The greater part of Spain's current refining capacity is represented by the CAMPSA refinery on the Canary Islands which can process 10,000 barrels a day and has 5000 barrels cracking capacity. This plant is now being enlarged and facilities are being added for special products. There is a small, 500-barrel refinery located at Cartagena, but currently it is reported that a 20,000 barrel plant is planned at Cartagena for processing Middle East crudes. As planned it would be owned partly by the California-Texas group, and partly by local interests.

SWEDEN

SWEDEN's production of more than a million barrels of shale oil a year is no more than a start toward satisfaction of its consumption. Such drilling for oil as has been carried on has not resulted in the development of any commercial sources, and the country remains dependent upon imports. Most imports are in the form of refined products, although a little more than 4 million barrels of crude were brought in during 1948. Sweden's imports of all oils amounted to 24.5 million barrels. The largest single item is fuel oil, including diesel fuel, which amounted to 13.4 million barrels last year.

Shale oil deposits are in the provinces of Närke, Västergöland and Östergötland, as well as the island of Öland. The Närke area is the best suited for working and it is from there that most recovery is obtained.

YUGOSLAVIA

YUGOSLAVIA is making every effort to expand its production under the Five-Year Plan which includes the years 1947 to 1951. It has set a volume of 9250 barrels daily as the goal to be reached in 1951, which would call for sharp expansion in the light of its producing history. During the German occupation in 1944 the country produced its peak of 2000 barrels a day, and early in 1948 it was reported that daily average production was just under 1100 barrels. Estimates are that output for the year amounted to no more than 366,000 barrels. This would bring total cumulative production to 2,147,000 barrels.

Current production is mostly from the Lendva area in the northwest part of the country, with some from the old Peklenicza and Selnica fields and others in the Goilo area. The chairman of the Planning Commission recently stated that there would be no need to import crude oil, since by that time the domestic industry would be able to produce enough equipment to permit large-scale petroleum production.

A new refinery with capacity of 6500 barrels daily is planned for completion some time in 1950, to bolster the current capacity of 8100 barrels distributed among 5 small plants.

U. S. S. R.

SOVIET Russia's actual output of petroleum for the past several years is still very much a matter of speculation on many quarters. Although there is no official figures being released on production and drilling, the various reports which rate the performance of the petroleum industry in relation to previous years, seem to agree that there has been an increase in output for the year 1948 amounting to 13 percent more than production during the preceding year. The official Soviet statements say that in addition, this represents an 8 percent increase over the production goal for the year.

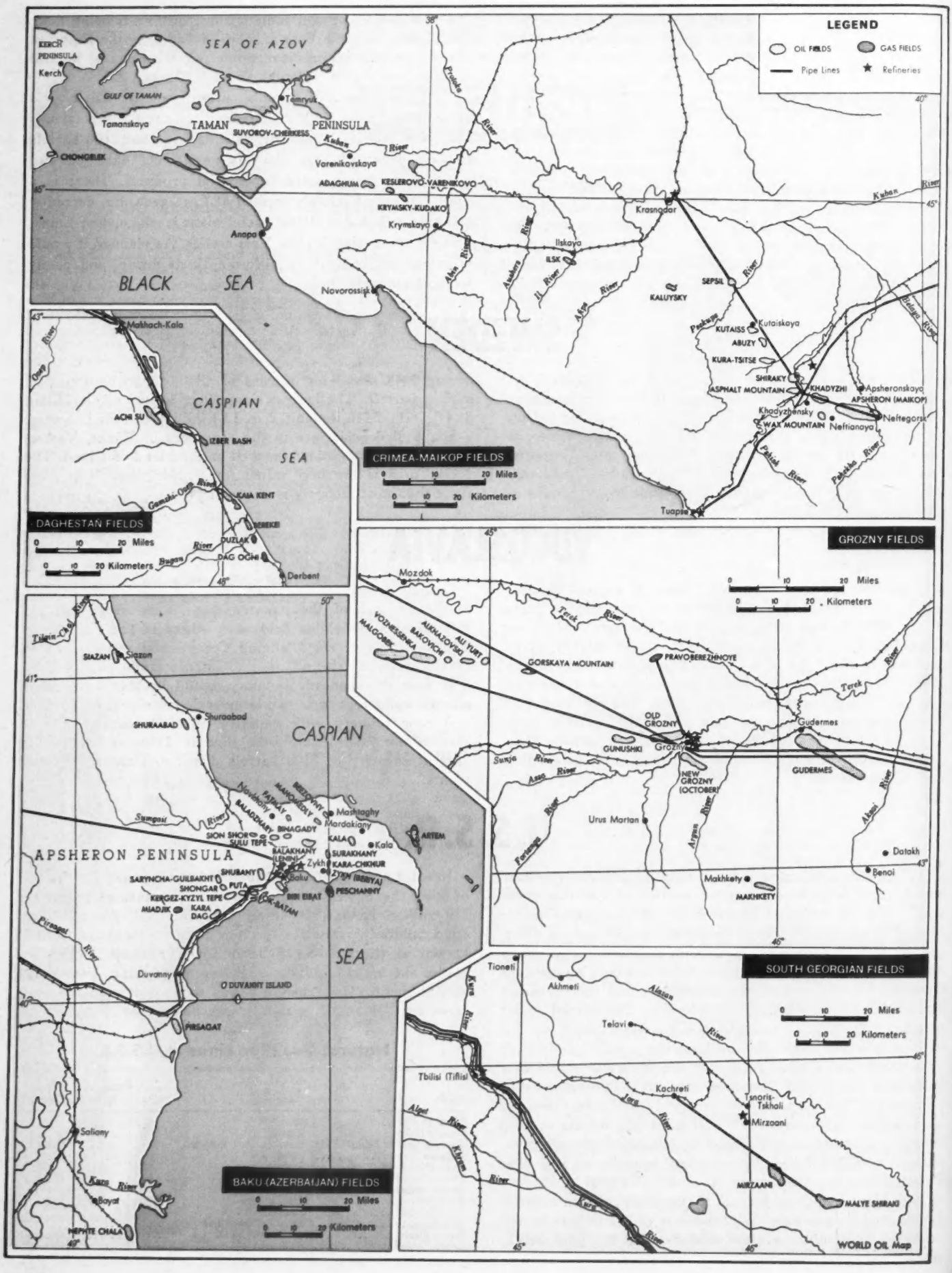
On the basis of such reports it has been calculated that production during 1947 amounted to about 189 million barrels, which would indicate a total output for 1948 of something like 213.5 million barrels or 283,400 barrels daily, a substantial step toward realization of the Five-Year Plan, which called for production of 248 million barrels of oil annually by 1950. The Russians now say they expect to reach this goal by the end of 1949. However, there are still no signs that the oil industry has reached its pre-war production rate of 217 million barrels yearly, so most observers are doubtful that the goal will be reached this year.

In setting the goal of 248 million barrels yearly by the end of 1950, the Soviets assigned to Baku the task of producing 119 million barrels, or nearly half the total. An additional 101.5 million barrels was to come from the fields of what is known as the Russian Federal Soviet Republic, which includes the areas of Maikop, Grozny, Daghestan, Ural-Volga and Sakhalin. The remainder was scheduled from the scattered smaller areas. It now seems likely that if the overall

Natural Gas Pipe Lines in U.S.S.R.

Origin	Terminus	Length (Miles)	Diameter (Inches)	Year Completed
Elshanka Field	Saratov	17	16-18	1942
Saratov Fields	Moscow	500	.....	1947
Dasawa (former Poland) Field	Kiev, branch to Vinnitsa	350	.....	1947
Daszawa Field	Lwów	....	.....	....
Buguruslan Field	Kuibyshev	97	10	1943
Palvan-Tash Field	Leninsk	....	.....	....
Pravoderezhnoe Field	Grozny	16	.....	1947
Yablonovo	Pokhirstnevo	20	.....	....
Archeda Field	Frolov	....	.....	....
Morshansk	Saratov-Moscow line	....	.....	....
Izhma Field	via Mololov to Izhevsk	....	.....	....
Latvia Shale Works	Stalingrad	....	.....	....

U. S. S. R.—Southern European Fields



goal is reached the production will be distributed in a different proportion than had been anticipated. During 1948 the Eastern fields accounted for 48.5 percent of Russia's total output, while in 1945 these fields produced only 33.5 percent.

The departments concerned with the petroleum industry said the drilling of oil wells during 1948 was 28 percent higher than in 1940, but the industry did not fulfill its quota of exploration drilling. The reported increases of 12 percent for gasoline and 17 percent for kerosene production would indicate that steps have been made toward increasing refining capacities, either through rehabilitation or new construction.

One of the interesting developments in the producing picture is the admitted unequal progress made in the principal producing areas. Whereas the newer "Eastern Fields" which have been referred to as the "Second Baku" were able to step up their output by 19.3 percent, the western and southern

Engineering and Geological Data on U. S. S. R. European Fields

Area and Field	PRODUCING FORMATION		
	Age	Depth (Feet)	Type Structure
Baku (Azerbaijan) Area:			
Artem (Holy Island)	Middle and Lower Pliocene	3500-9000	Anticlinal Fold
Baladzhary	Lower Pliocene	4729	Anticline
Bibi Eibat	Middle Pliocene	3500-5000	Anticline
Binagady	Lower Pliocene	1500-3116	Anticlinal Fold
Fatmay	Upper Pliocene	1788	Anticline
Kala	Upper to Lower Pliocene	2800-4200	Dome on Fold
Kara-Chkhur	Middle to Lower Pliocene	3440-9000	Anticline
Kara Dag	Middle Pliocene	5340	Anticlinal Fold
Kergez-Kyzyl Tepe	Middle Pliocene	.....	Anticline
Lenin (Balakhany, Sabunchy, Ramany)	Upper to Lower Pliocene	3800-5184	Anticline
Lok-Batan (Mikoyan)	Middle Miocene to Upper pliocene	.....	Anticlinal Fold
Mahomedly	Upper Pliocene	.....	Anticline
Miadjik	Middle Pliocene	Shallow	Anticline
Nephte Chala	Pliocene	.....	Folded Fault
Peschanny	Middle to Lower Pliocene	.....	Anticline
Pirsagat	Middle Pliocene	4120	Anticlinal Fold
Puta (Molotov)	Middle Pliocene	.....	Anticlinal Fold
Sarynchа-Guilbakht	Middle Pliocene	.....	Anticlinal Fold
Shongar	Middle Pliocene	.....	Anticlinal Fold
Shuraabad	Oligocene	Shallow	Overthrust Fold
Shubany (Atashka)	Lower Pliocene	.....	Diapir Fold
Sion Shor	Lower Pliocene	5180	Anticlinal Fold
Siazan	Cretaceous and Oligocene	.....	Overthrust Fold
Surakhany	Upper to Lower Pliocene	3800-5200	Anticline
Sulu Tepe	Lower Pliocene	5200	Anticlinal Fold
Zykh (Beriya)	Middle and Lower Pliocene	.....	Anticlinal & Dome
Carpathian Area:			
Bitkow	Oligocene	3610	Anticline
Boryslaw	Oligocene (Eocene, Cretaceous)	4270-5700	Folds
Csarna	Oligocene	1310	Anticlinal Fold
Dassawa	Miocene	2300	Anticline
Kosmacs	Cretaceous	1920	Anticline
Lipic	Oligocene	1310	Anticline
Lodyna	Oligocene	1150-1900	Diapir Fold
Majdan	Eocene	590-1650	Anticline
Nahujowice	Oligocene and Eocene	535- 656	Anticline
Opaka	Eocene	1970	Anticline
Orow	Cretaceous	300-1835	Fold
Perehinsko	Oligocene	2625	Anticline
Polana	Oligocene	325- 685	Anticline
Rajskie	Oligocene	980-1300	Asymmetrical Fold
Rypne	Oligocene	500-3700	Fold
Schodnica-Urycez	Cretaceous	1480	Anticline
Slobada-Rungurska	Cretaceous	400-1000	Anticline
Strzelbice	Cretaceous	660	Anticline
Crimea Area:			
Chongelek	Middle Miocene	.....	Diapir Fold
Feodosiya	Middle Miocene	.....	Anticlinal Fold
Daghestan Area:			
Achi Su	Middle Miocene	985-2300	Anticlinal Fold
Berekei	Oligocene & Eocene Contact	.....	Domal Uplift
Dag Ogni	Oligocene	60-1000	Domal Fold
Duzlak	.....	.....	Dome
Isber Bash	Middle & Lower Miocene	3025-4685	Domal Anticline
Kaia Kent	Middle Miocene	655-1640	Anticline
Emba Area:			
Baichunas	Jurassic	.....	Salt Dome
Chernaya-Retchka	Jurassic	Shallow	Salt Dome
Dossor	Jurassic	246- 690	Faulted Dome
Dshaksymai	.....	.....	Faulted Dome
Iskine	Jurassic-Salt Core Contact	2195	Salt Dome
Koschaghyl	Jurassic	350-1200	Salt Dome
Kulsary	Jurassic	.....	Salt Dome
Makat	Jurassic	.....	Salt Dome
Novobogatinsk	Juraasic	.....	Salt Dome
Sagis	Lower Cretaceous & Middle Jurassic	328-2132	Faulted Dome
Shobarkuduk	.....	.....	Salt Dome

Area and Field	PRODUCING FORMATION		
	Age	Depth (Feet)	Type Structure
South Georgian Area:			
Malye Shiraki	Lower Pliocene & Upper Miocene	980-7850	Anticlinal Fold
Mirzaani	Lower Pliocene & Upper Miocene	980-7850	Anticlinal Fold
Grozny Area:			
Akhazovski	Middle Miocene	.....	Folded Overthrust
Ali Yurt	Middle Miocene	9185	Overthrust Fold
Bakovichi	Middle Miocene	.....	Anticline
Gorskaya Mountain	Middle Miocene	3530	Fold Anticline
Grozny, New (October)	Middle Miocene	7220-10200	Anticline
Grozny, Old	Middle Miocene	7220-10200	Folded Anticline
Gudermes	Middle Miocene	3840-4595	Anticline
Gunushki	Middle Miocene	4315	Anticline
Makhkety	Middle Miocene	3280-3940	Anticline
Malgobek	Middle Miocene	990-2300	Anticlinal Fold
Pravoberezhnoye	.....	.....	.....
Voznessenka	Middle Miocene	990-2300	Anticlinal Fold
Kama River Area:			
Krasnokamsk	Permian & Upper Carboniferous	2950-3100	Anticline
Overiata	Permian & Upper Carboniferous	.....	Anticline
Polazna	Permian & Upper Carboniferous	3400	Anticline
Severokamsk	Permian, Upper Carboniferous & Devonian	3200-5840	Anticline
Shilovo	Permian	3152	Anticline
Verkhne-Chusovskiye-Gorodki	Permian	3200	Buried Reef
Kuban-Maikop Area:			
Abuzy	Oligocene	2500-4920	Monocline
Adaghum	Upper Miocene	985	Diapir Fold
Asphalt Mountain	Lower Miocene & Oligocene	2240-2950	Monocline
Olsk	Oligocene	.....	Monocline
Kalujsky	Middle Miocene	.....	Monocline
Keslerovo-Varenikovo	Upper Miocene & Oligocene	1148-1640 2625-3280	Diapir Fold
Khadyzhensky	Oligocene	2240-3480	Monocline
Krymsky-Kudako	Middle Miocene	650-1640	Anticline
Kura-Tsitse	Lower Miocene & Oligocene	2250-2950	Monocline
Kutaiss	Lower Miocene & Oligocene	2240-2950	Monocline
Maikop (Apsheron)	Lower Oligocene	1640-3480	Monocline
Sepsil	Oligocene	.....	.....
Shiraky	Lower Miocene & Oligocene	2240-2950	Monocline
Suvorov-Cherkess	Pliocene & Miocene	330-1475	Domal Uplift
Wax Mountain	.....	.....	.....
Pechora Area:			
Ukhta (Chibien, Ust Kulom, Yareg, Izhma, Cherdin)	Devonian	.....	Anticline
Saratov Area:			
Dergachi	Upper Pliocene	383-3300	.....
Kurdium	Upper Pliocene	1716	.....
Teplovka	Upper Pliocene	1320	.....
Yelshanka	.....	.....	.....
Ukraine Area:			
Melitopol	Mesozoic	.....	Salt Dome
Poltava	.....	.....	Salt Dome
Romny	Mesozoic	.....	Salt Dome
Ural-Volga Area:			
Allaguvatovo	Lower Permian	1650-2085	Buried Reef
Buguruslan	Permian	985	Anticlinal
Buranchino	Lower Permian	1640-2085	Buried Reef
Ishimbaevo	Lower Permian	1640-2085	Buried Reef
Kusiankul	Lower Permian	1380-2490	Buried Reef
Kuzminovka	Lower Permian	.....	Buried Reef
Shugarov	.....	.....	.....
Smakaevo	Lower Permian	.....	Diapir Fold
Syzran	Upper & Lower Carboniferous	2130-3280	Domal Uplift
Termen-Yelga	Lower Permian & Devonian	2750	Reef
Tuimasa	Carboniferous	3440-3775	Buried Reef
Yablonovo (Stavropol)	Upper & Lower Carboniferous	2130-3280	Domal Uplift

How YOU can

CUT COSTS and INCREASE PRODUCTION

...by controlling corrosion

You can't stop corrosion. But you ***can*** control it.

Install equipment made with high-Nickel alloys. Monel,* for example. Or "K"* Monel. They've shown a good many producers that corrosive wells can be operated—*profitably*.

Take the experience of a Michigan firm that produces from the Sylvania formation a chemical brine with specific gravity of 1.28. At a depth of 2,400 feet, the pump they were using just didn't stand up. *But trouble ended when they installed a Reda pump equipped with a "K" Monel shaft and Ni-Resist diffusers.*

Then consider the story of this well in Louisiana. It had *plenty* of oil below the surface—but would only make gas on a ⅛" surface choke with 3,000 pounds pressure. Freezing of surface flow lines and connections was frequent. The allowable couldn't be produced.

After the operator installed an Otis Removable Bottom Hole Regulator made of "K" Monel, surface pressure dropped to 1,350 psi. Freezing stopped. Gas-oil ratio was cut to a point where almost no oil was wasted. The regulator stayed in the tube 57 months, produced 869,839 barrels before it was pulled for inspection. *It was found in first-class condition.*

Of course, corrosion resistance is only one quality that contributes to the dependability of equipment like this. Extra strength, hardness, toughness or resistance to wear and abrasion may also be vital. *In high-Nickel alloys, you get the combination of properties you need.* Through years of use in the toughest areas of the mid-continent district, Monel and "K" Monel have proved especially well adapted to combat harsh conditions.

Monel, in addition to being rustproof and highly resistant to sour crudes, withstands the cutting action of high-pressure gas, provides unusually good resistance to erosion and abrasion by entrained solids. **"K" Monel** brings you those same characteristics *plus* extra strength and hardness. It is non-magnetic; by heat treatment its tensile strength can be developed to 140-170,000 psi, its hardness to 265-320 Brinell.

Both Monel and "K" Monel are used for parts subject to alternating stresses in the presence of corrosives. Their retention of good fatigue strength is particularly evident in extended equipment life.

The full story of how you can put these and other INCO Nickel Alloys to work for you is contained in our new, illustrated booklet, *Controlling Corrosion in Petroleum Production Equipment.* It brings you typical performance and service stories of Nickel Alloys in a variety of corrosive uses. It discusses the important factors in reducing maintenance and replacement costs. There are sections dealing with exploration and drilling, pumping, and gas control.

The booklet tells, too, how you can get free technical advice on the selection of materials for severe service, and contains a listing of valuable Technical Bulletins that are available to you on request. Write for your copy—*now*. We'll get it into the next outgoing mail. *Reg. U. S. Pat. Off.

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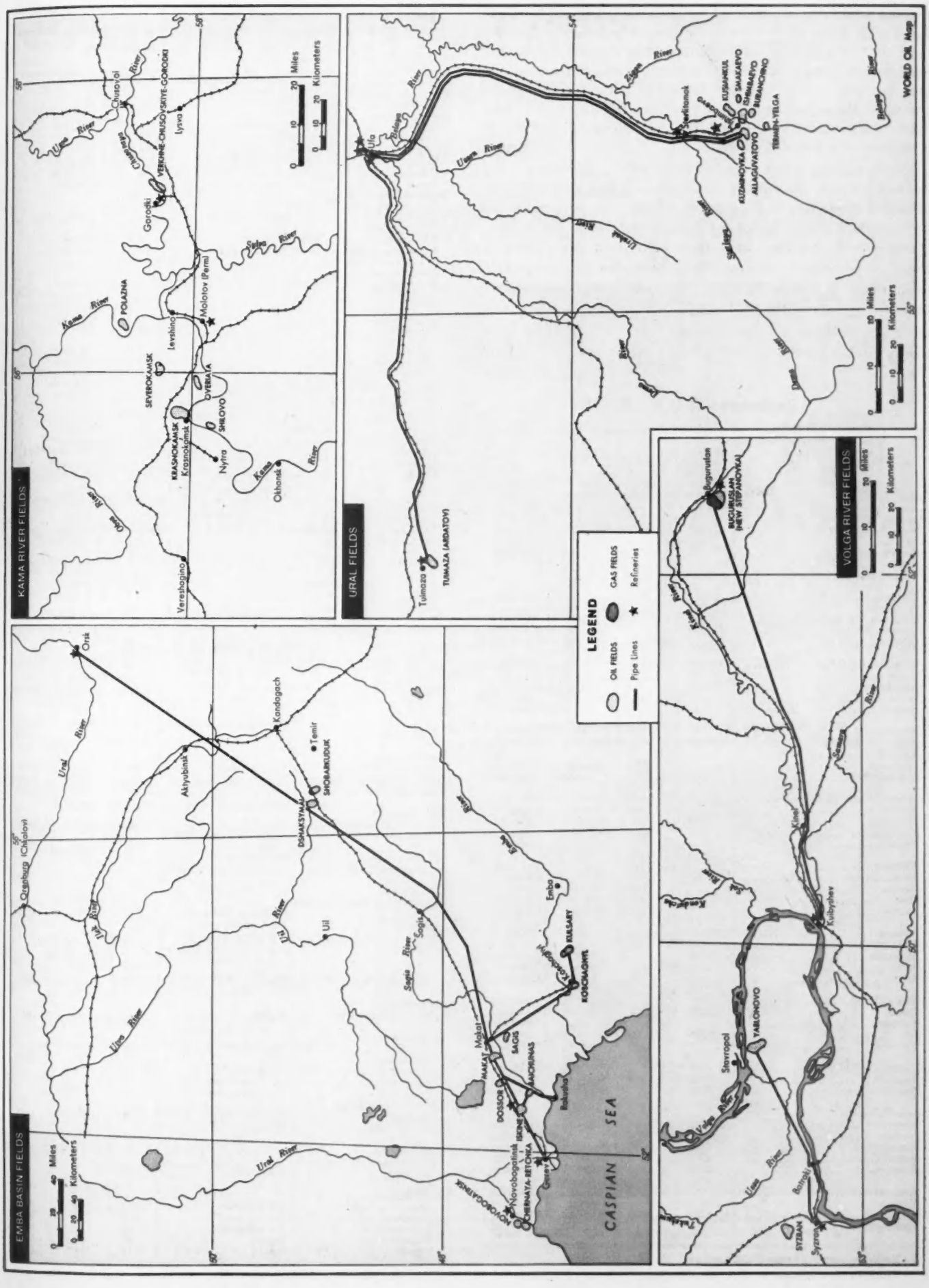
MONEL..."K" MONEL...

Your partners in PROGRESS

U. S. S. R.—Eastern European Fields



U. S. S. R.—Continued

regions which include the old established fields of the Caucasus with Baku as the center have only increased 6 percent over 1947. This shows not only the slow recovery from the very severe damage which the industry sustained during the war, but also the progressive depletion of the older fields in the area. Recently the distress over the failure of the Baku fields to show additional production was expressed in a public utterance of a Russian official.

While making every effort to build up its oil industry, the Soviets are also developing gas resources and making them available to industrial consumers. Production of gas is said to have been raised by 10 percent during the past year, and a number of pipe lines have been built from gas producing areas to populated centers. There was also one project to exploit gas shales in Estonia. The Soviets have announced that the unit installed at Kokhtle-Jarva is the world's first shale gas industry. A pipe line has been built from the new works to Leningrad.

Refineries of U.S.S.R.

LOCATION	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Type of Refinery	Operating Status
European Refineries:				
Baku (5 Refineries)	375,000	50,000	Skim-Crk.	Operating
Batumi	2,000	.....	Skim.	Operating
Berdyansk	.....	5,000	Crk.	Operating
Boulova	.....	.....	.....	Unknown
Burguruslan	.....	.....	.....	Operating
Chelyabinsk	.....	.....	.....	Operating
C. Gorodki	28,000	5,000	Skim-Crk.	Unknown?
Drohobycz[1] (4 Refineries)	3,000	1,000	Complete	Rebuilding
Gleboka (Sambor)[1]	100	.....	Skim.	Rebuilding
Gorki	.....	10,000	Cracking	Operating
Grozny (3 Refineries)	150,000	50,000	Skim-Crk.	Operating
Gurev	1,000	.....	Skim.	Operating
Ishimbaevo	9,000	.....	Topping	Operating
Iskine	.....	.....	Topping	Unknown
Kazan	.....	.....	.....	Unknown
Kherson	.....	5,000	Cracking	Operating
Krasnodar (Maikop)	25,000	.....	Skimming	Rebuilding
Kuibyshev	.....	.....	.....	Operating
Leningrad	.....	5,000	Cracking	Destroyed
Makhach Kala	2,000	.....	Skimming	Operating
Molotov (Perm) (2 Refineries)	12,000	4,000	Skim-Crk.	Operating
Moscow	.....	12,800	Cracking	Operating
Munkacs[2]	420	.....	Skimming	Unknown
Nadworna[1]	200	.....	Skimming	Unknown
Nebit Dag	.....	.....	.....	Building
Nikolaev	.....	.....	.....	Unknown
Novobogatinsk	500	.....	Skim.	Operating
Odessa	.....	5,000	Cracking	Operating
Orsk	28,000	5,000	Skim-Crk.	Operating
Saratov	.....	35,000	Cracking	Operating
Sernovo	.....	.....	.....	Operating
Stalingrad	.....	.....	.....	Rebuilding
Sterlitmak	15,000	.....	Skimming	Operating
Stryj[1]	250	.....	Skimming	Unknown
Syzran	.....	.....	.....	Operating
Tbilisi (Tiflis)	.....	.....	.....	Operating
Tuapse	35,000	10,000	Skim-Crk.	Rebuilding
Tuimaza	.....	.....	.....	Operating
Ufa	28,000	5,000	Skim-Crk.	Operating
Ukhta	.....	.....	Topping	Operating
Ustrzyl i Dolna[1]	1,000	.....	Skimming	Unknown
Yaroslavl	9,000	4,000	Skim-Crk.	Operating
Zniesienie (Lwów)[1]	1,000	.....	Skim-Lube	Unknown
Asiatic Refineries:				
Fergana (4 Refineries)	40,000	10,000	Skim-Crk.	Operating
Irkutsk	.....	.....	.....	Operating
Khabarovsk	4,500	3,500	Skim-Crk.	Operating
Komsomolsk	4,500	3,500	Skim-Crk.	Operating
Krasnovodsk	4,000	3,000	Skim-Crk.	Operating
Krasnoyarsk	.....	.....	.....	Operating
Moskalvo	.....	.....	Topping	Operating
Nikolaevsk	4,500	3,500	Skim-Crk.	Operating
Vladivostok	.....	.....	.....	Operating

[1] Refineries located in former Polish territory.

[2] Refinery located in former Czechoslovakian territory.

Engineering and Geological Data on U. S. S. R. Asiatic Fields

Area and Field	PRODUCING FORMATION Age	Depth (Feet)	Type Structure
Eastern Siberia Region:			
Ust Maya	.....	.....	.....
Sakhalin Island:			
Ekhabi	Upper Pliocene	310- 630	Anticline
Katangli	Upper Pliocene	2460	Anticline
Nutovo	Upper Pliocene	260-2885	Anticline
Okha	Upper Pliocene	300- 775	Anticline
Poromay	Middle & Lower Pliocene	8858	Anticline
Wigrek	Upper Pliocene	120- 220	Anticline
Turkmen Area:			
Cheklishlyar	Middle Pliocene	.....	.....
Cheleken	Pliocene	.....	Faulted Dome
Mangshlak	.....	.....	.....
Nebit-Dag	Middle Pliocene	820	Anticline
Neftedag	Upper & Middle Pliocene	.....	Anticline
Uzbek-Tadzhik-Kirgiz (Fergana) Area:			
Ak-Mecket	Eocene	.....	Anticline
Andizhan	.....	.....	Anticline
Barzik	.....	.....	Anticline
Changirtash	.....	.....	Anticline
Chimmon	Eocene	1000	Anticline
Chu	.....	.....	Anticline
Dzhar-Kurgan	.....	.....	Anticline
Encunimsai	.....	.....	Anticline
Eno-Sing	.....	.....	Anticline
Kamishbashi	.....	.....	Anticline
Kanabad-Sai	.....	.....	Anticline
Kaudag	Oligocene	528	Anticline
Kim (Sel Rokho)	Eocene	.....	Anticline
Kirovabad	.....	.....	Anticlinal Fold
Komosol	.....	.....	Anticline
Kulmen	.....	.....	Anticline
Mailisai	.....	.....	Anticline
Melnikovo	.....	.....	Anticline
Namangan	.....	.....	Anticline
Nefteabad	.....	.....	Anticline
Pavlan-Tash	.....	.....	Anticline
Pitausai	.....	.....	Anticline
Ristansanto	.....	.....	Anticline
Shor-Su (Kagnovich)	Eocene	650	Anticline
Tekebel	.....	.....	Anticline
Uch Kyzyl (Termez)	.....	.....	.....

Oil Pipe Lines in U.S.S.R.

Origin	Terminus	Length (Miles)	Diameter (Inches)	Year Completed
Baku Area:				
Baku fields	Batumi on Black Sea	510	10	1928
Baku fields	Batumi	550	8	1905
Dagestan Area:				
Izber Bash field	Makhach-Kala	40	8	1939
Makhach-Kala on Caspian	Grozny	100	12	1924
Makhach-Kala	Grozny	100	12	1935
Emba Area:				
Guriev on Caspian Sea	Orsk	525	12	1935
Koschagyl field	Makat on Guriev-Orsk line	60	8	1935
Kulsary field	Koschagyl field	12	8	....
Rakuska on Caspian Sea	Dossor on Guriev-Orsk line	35	8	1930
Grozny Area:				
Armavir (on Grozny-Tuapse line)	Gorlovaka (Trudovaya)	305	12	1933
Armavir	via Trudovaya to Dnepropetrovsk	...	..	....
Grozny fields	via Armavir and Maikop fields to Tuapse on Black Sea	385	10	1928
Maglobek field	Grozny	55	8	1940
Maikop Area:				
Maikop (Neftegorvsk)	Krasnodar	67	8	1940
Sakhalin Area:				
Okha field	Moskalvo	20	10	1942?
Ekhabi field	Okha	12	10	1937
Moskalvo	Nikolaevsk	....	..	....
Nikolaevsk	via Kamsomolsk to Khabarovsk	....	..	....
South Georgian Area:				
Mirsaani	Kachreti	25	8	1940
Little Shiraki	Mirsaani	....	....	....
Turkmen Area:				
*Krasnovodsk on Caspian Sea	Ashkhabad	300	..	....
Ural-Volga Area:				
Ishimbaevo fields	Ufa refineries	103	6	1939
Ishimbaevo fields	Ufa refineries	103	12	1940
Tuimaza fields	Ufa refineries	95	12	1940
Yablonovo field	Batraki	45	12	1940
Batraki	Syzran	14	10	1947

* Products line.

Your Own Canning Plant at These Two General American Public Tank Storage Terminals

TANK STORAGE TERMINALS
GENERAL AMERICAN
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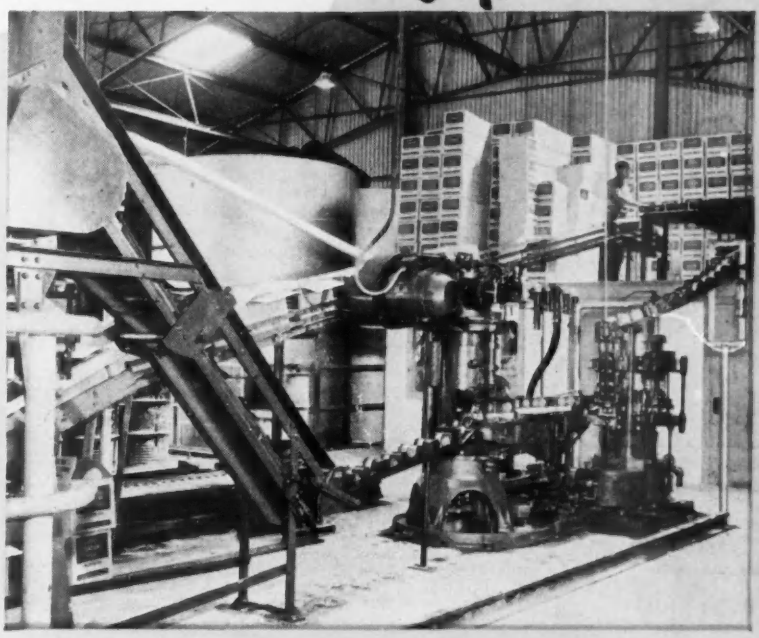
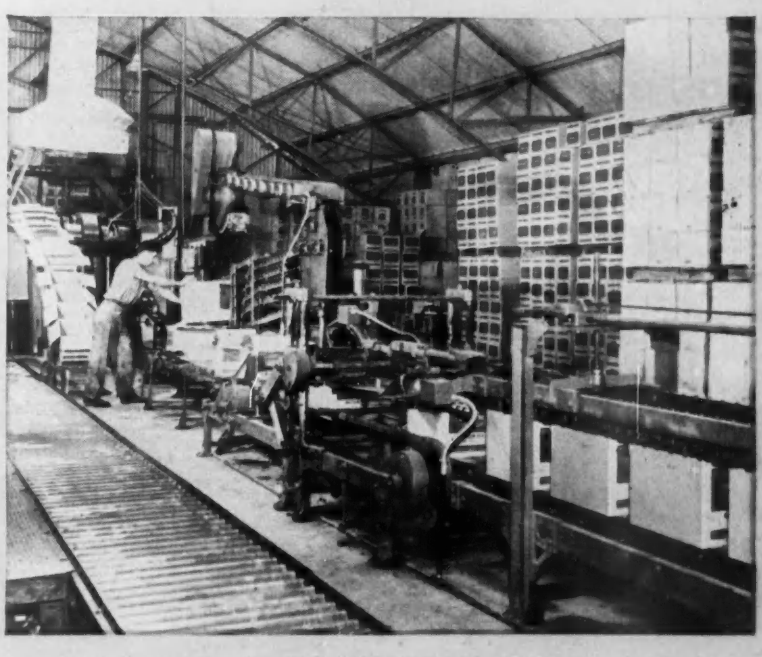
. . . . but NO investment of your own!

180 one-quart cans per minute . . . of your own petroleum product, blended to your own specifications . . . that's the capacity of the high-speed canning equipment available to General American customers at the Carteret, N. J., and Goodhope, La., Terminals. Barrels and drums can also be filled at these plants, assuring you of quick distribution and sale of *your* blend in *your* package.



Up-to-the-minute equipment sends empty cans through an unscrambler to an automatic filling machine; next step is closing by an ingenious capping device.

At all General American Public Tank Storage Terminals, any liquid that flows through a pipeline may be blended and stored.



Twenty-four cans at a time are loaded in the cartons, which are then closed and glued before being stencilled and shipped. Capacity: more than seven cases per minute!

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TANK STORAGE TERMINALS

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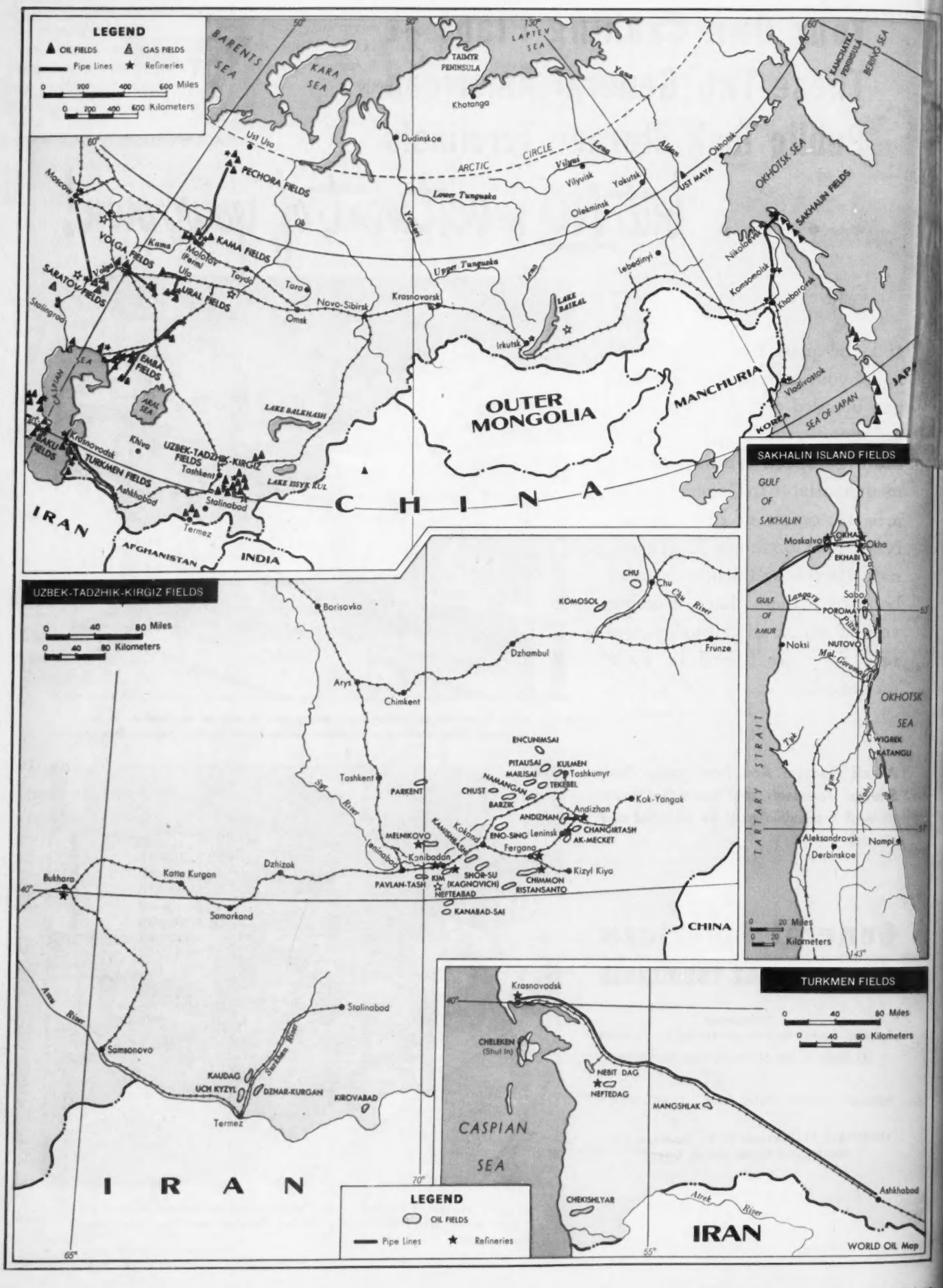
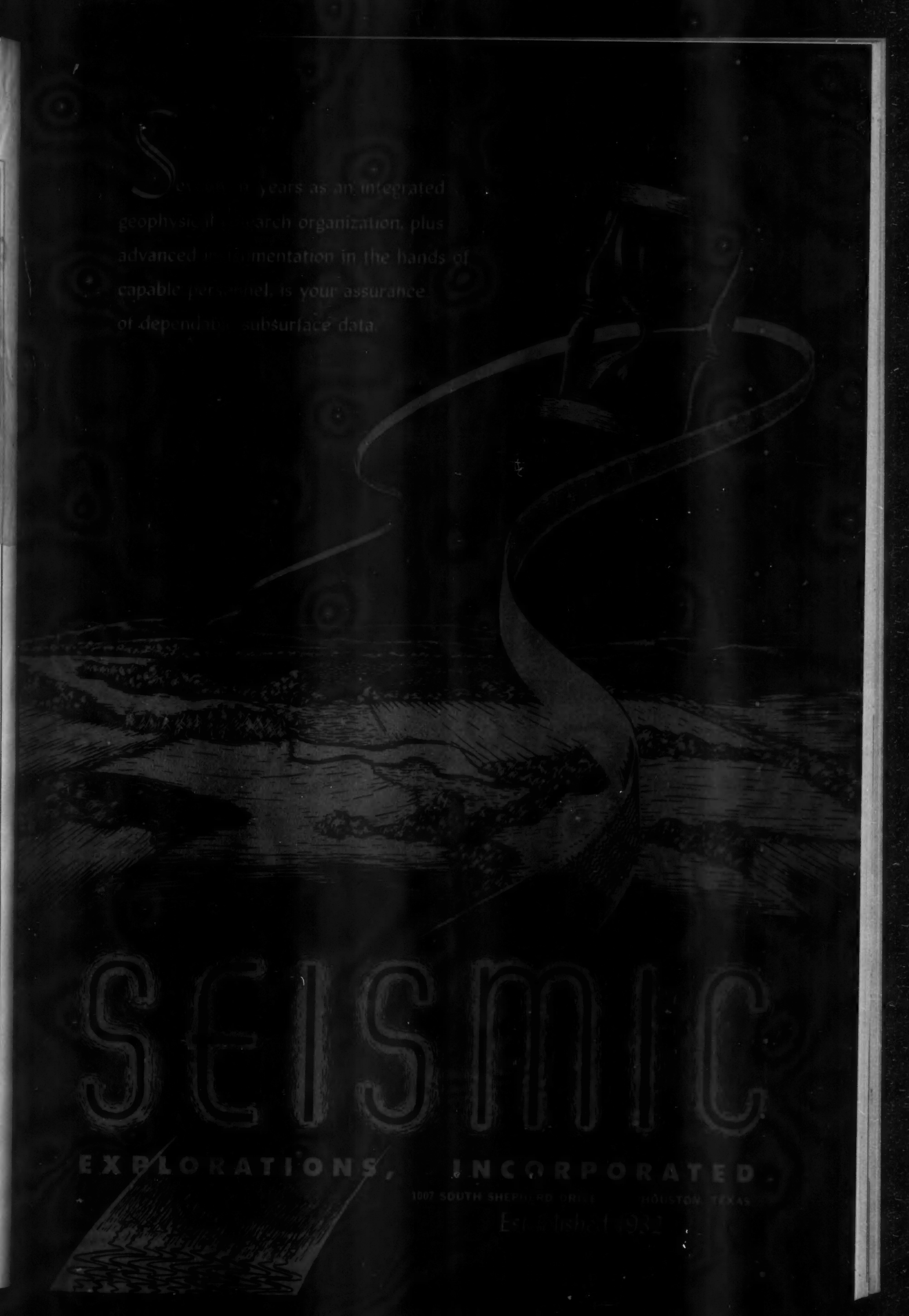
WORLD'S LARGEST PUBLIC TANK STORAGE SYSTEM

TERMINALS AT: Carteret, N. J.; Goodhope, La.; Houston and Corpus Christi, Texas

U. S. S. R.—Asiatic




Seismic
EXPLORATIONS, INCORPORATED

ALGERIA

PETROLEUM operations in Algeria are carried on by the Société Nationale d'Etudes et de Recherches Pétrolifères en Algérie (SN. REPAL) in which both the French and Algerian governments are interested. Two small fields have been found: Ain Zeft, now shut down after yielding a total of 23,600 barrels, and Tliouanet which produces about 2 barrels daily from 5 wells. Cumulative production for Algeria is 251,870 barrels. The drilling activity for the past two years has been exploratory only, and six wildcats representing a total of 29,200 feet of hole were drilled in 1948. In 1947 there were 5 wildcats and 8 core holes for a total of 14,685 feet of hole. Slight shows were noted in Rabelais 2, a recent test about 90 miles northeast of Oran in the Chelif basin.

Geological and geophysical work is going on in the Chelif basin and in other parts of Algeria. The first drilling operation in the Aumale district was started just before the end of the year. Equipment now in use consists of two lights rigs used for wildcatting, and two portable outfits used for drilling core holes.

Wildcats Completed in Algeria in 1948

Region	Company and Well	Date Completed	Total Depth (Feet)	Results
Chelif Basin	Société Nationale d'Études et de Recherches Pétrolières en Algérie			
	Temaznia	January	2,500	Salt water (Miocene)
	Rabelais 1	March	5,700	Dry (Miocene)
	Bou Guirat	May	2,700	Dry (Miocene)
	El Bordj	September	2,800	Salt water (Cretaceous)
	Warnier	November	8,000	Salt water (Miocene)
	Rabelais 2	December	7,500	Shows (Miocene)
Total	6 wells		29,200	

EGYPT

EGYPT, while reaching a new all-time peak in production during 1948, still finds itself in a rather uncertain position at the end of the year as regards its future development. Following an outstanding year of exploratory success, the implications of the new petroleum law are such that most operators feel their activity will be too rigidly controlled by the Government to allow them to lay out their normal long-range programs. One company has already retired from active operations.

Petroleum production during 1948 reached a total of 13,172,648 barrels, an increase of 41.5 percent over 1947, chiefly through the yield from the new Sudr field which went on production late that year. At the close of 1948 Sudr was producing 12,758 barrels a day from six wells, and Egypt was producing at a rate of 42,508 barrels daily. Early in the year it had been thought that the Hurghada field might show an increase through discovery of a new flank area, but this proved to contain only one well which did not maintain its original flow.

During the past year the Asl field which had been indicated in the latter part of 1947 was confirmed, and a new discovery was made at Ras Matarma. The two new areas are about 10 and 6 miles respectively south from the Sudr field. The former attracted considerable attention during the early part of 1949 when an outpost flowed on short production tests at rates upward of 40,000 barrels a day. Later tests showed it capable of sustained production at about 3500 to 5000 barrels daily. Asl is producing from Eocene Limestone similar to the pay at Sudr, and has also proved production in a Miocene sand. Ras Matarma is producing from Miocene sand, although a slightly heavier oil. At the end of the year only two wells had been completed. Egypt should show a substantial increase in output in 1949.

The Asl and Ras Matarma fields are on acreage jointly held by the Shell Group and by Socony-Vacuum Oil Company, and both are operating the properties.

Early in 1949 Standard Oil Company of Egypt, which has been engaged in exploratory operations in Egypt for 12 years, announced that it is suspending operations which have cost a total of about $12½ million. The announcement came shortly after one of its wildcats, at Wadi Feiran, had opened a new oil field, its first discovery since it started working in Egypt. This area is about 155 miles south of Suez on the Sinai Peninsula within easy access of water transportation.

A total of 20 wells were drilled by all operators during 1948, representing 78,876 feet of hole. This compares with 15 wells and 70,370 feet of hole in 1947. Six wildcats were completed, resulting in discovery of two new oil fields.

The new Mines and Quarries Law, which regulates the petroleum industry, is indicative of the increasing nationalistic attitude of the Government, and its enforcement of the law will have much to do with the trend of production and development. One of the provisions prohibits export except in the form of refined products processed in Egypt. This would bottleneck production at its current level since it is now above the rated capacities of the two refineries. The Government has already refused request by the Shell Group to expand its Suez refinery unless Shell is prepared to let the Government have a 51 percent share in the plant. Several

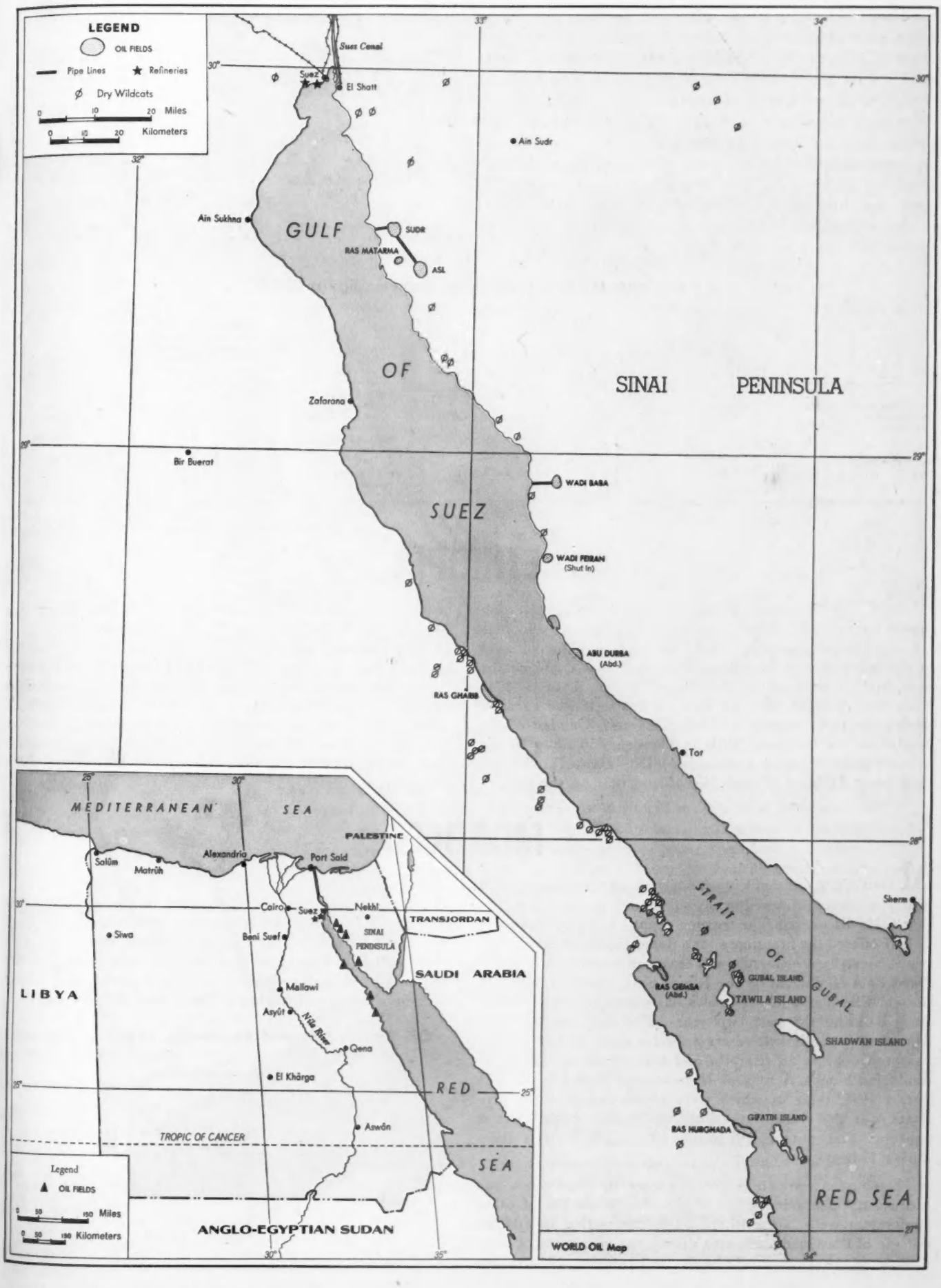
Drilling in Egypt

Field	Wells Completed in 1947				Wells Completed in 1948				Wells Drilling and Shut Down at End of 1948		
	Oil	Dry	Total Wells	Total Footage	Oil	Dry	Total Wells	Total Footage	Drlg.	S.D.	Total
Ras Hurghada	..	..	..	.....	1	2	3	10,091	1	..	1
Ras Gharib	6	..	6	15,933	3	..	3	10,090	..	1	1
Sudr	3	..	3	21,388	6	2	8	21,291	1	1	2
Wildcats	..	6	6	33,049	2	4	6	37,404	1	1	2
Total	9	6	15	70,370	12	8	20	78,876	3	3	6

Oil Production and Producing Wells in Egypt

FIELD	Operating Company	Year of Discovery	Producing Oil Wells End of 1948				Crude Oil Production (Barrels)			
			Shut In	Flowing	Art. Lift	Total Producing	Daily End of 1948	Year 1947	Year 1948	Cumulative Through 1948
Ras Gemsa (abnd.)	Anglo-Egyptian Oilfields, Ltd.	1908	1	..	..	....	.....	.....	.....	1,420,000
Ras Hurghada		1913	3	..	43	43	744	351,000	340,584	37,328,584
Ras Gharib		1938	43	18	62	80	29,006	8,847,000	9,332,867	78,432,347
Sudr	Anglo-Egyptian Oilfields, Ltd. and Socony-Vacuum Oil Co.	1946	3	6	..	6	12,758	118,000	3,499,197	3,618,197
Total			50	24	105	129	42,508	9,316,000	13,172,648	120,799,128

EGYPT


LEGEND
OIL FIELDS
Pipe Lines
Refineries
Dry Wildcats
Miles
Kilometers
Suez Canal
Suez
El Shatt
Ain Sudr
Ain Sukhna
GULF
SUDR
RAS MATARMA
ASL
OF
SINAI PENINSULA
Zafarana
Bir Buerat
WADI BABA
SUEZ
WADI FEIRAN
(Shut In)
ABU DURBA
(Abd.)
RAS GHARIB
Tor
MEDITERRANEAN SEA
PALESTINE
Salûm
Matrûh
Alexandria
Port Said
Cairo
Suez
Nekhl
TRANSJORDAN
SINAI PENINSULA
Siwa
Beni Suef
SAUDI ARABIA
LIBYA
Mallawi
Asyût
Nile River
Qena
El Khârga
RED SEA
TROPIC OF CANCER
Aswân
Legend
OIL FIELDS
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Kilometers
ANGLO-EGYPTIAN SUDAN
STRAIT OF GUBAL
Sherm
GUBAL ISLAND
RAS GEMSA
(Abd.)
TAWILA ISLAND
SHADWAN ISLAND
GIFATIN ISLAND
RAS HURGHADA
RED SEA
WORLD OIL Map

EGYPT—Continued

proposals have been made for new refinery construction, but none have been acted upon. Meanwhile the Egyptians must make some dispensation relaxing the regulation, since the heavy oils of the Sinai fields will not yield enough light products for the country's needs if production is held to total throughput capacity of plants.

Leasing regulations have also been affected by the new law which places restrictions on size and shape of concessions, increases rentals and royalties, and carries continuous drilling provisions which could be burdensome to operators. At the same time Government agencies retain full supervision of activities, with government approval required for many normal routine field practices.

Wildcats Completed in Egypt in 1948

Region	Company and Well	Date Completed	Total Depth	Result and Formation
Sinai	Anglo-Egyptian Oil Company and Socony-Vacuum Oil Company's Asl 2	February	3,910	Discovery well; I.P. 1509 barrels 22 - gravity oil daily through $\frac{7}{16}$" choke.
	Matarma 1	August	6,093	D. & A.
	Matarma 2	November	3,649	Discovery well; shut in; produces 18 - gravity oil; Miocene sand.
	Standard Oil Company of Egypt's Lagia 1	February	3,995	D. & A.
	Lagia 2	November	8,382	D. & A.
	Tawila 2	May	11,375	D. & A.
Total.	6 wells		37,404	

Engineering and Geological Data on Egypt Fields

Field	Proved Area (Acres)	Range of Gravity of Oil (A.P.I.)	Name	Kind	Age	Depth (Feet)		Average Thickness of Pay (Feet)	Type of Structure
						Minimum to Top of Pay	Maximum to Bottom of Pay		
Asl	200	14–22	.....	Lime and Sand	Miocene and Eocene	2873	3870	.....	Anticline
Ras Gemsa (abnd.)	40	23	.....	Lime	Miocene	400	2000	100	Anticline
Ras Hurghada	500	22–24	.....	Conglomerate and Sand	Miocene and Cretaceous	700	2500	100	Anticline
Ras Gharib	1000	25–26	Nubian	Sand	Carboniferous	1600	2500	400	Faulted
				Sand	Cretaceous	1600	2000	75	Monocline
				Lime	Miocene	1200	1900	300	
Ras Matarma	40	19	.....	Sand	Miocene	1940	2120	.....	Anticline
Sudr	240	22–24	.....	Lime and Sand	Basal Miocene and Eocene	2650	3100	.....	Anticline

ETHIOPIA

SINCLAIR Petroleum Company, which owns exploration concessions on all Ethiopia, had to cease work early in 1948 when it became apparent that the crews and equipment were in too much danger from local tribesmen who could not be completely controlled by the British police. Late in 1948 work was resumed, and the first wildcat well was spudded during the early months of 1949, This test, Gumburo 1, is located in the Gumburo Hills in Ogaden, 250 miles by air and 475 miles by road southwest of Dire Dawa. Equipment came in at Djibouti, French Somaliland port on the Gulf of Aden, and was moved 186 miles by rail to Dire Dawa after which it faced the long truck haul to the camp site.

The Ogaden region is about the size of the State of Kansas, and for three years Sinclair has carried on extensive geological studies centering around this area. Exploration started with geographical examination of aerial photographs, after which field parties checked the preliminary findings. The first well is scheduled to go to 15,000 feet if necessary, and should furnish valuable stratigraphic knowledge of this little-known region.

MOROCCO

MOROCCO, although a producer of oil for more than 30 years, has never produced in any substantial quantity from the first fields discovered. The opening of the Oued Beth field late in 1947 offered the first hopes for a domestic oil industry which might meet local demands and leave an exportable surplus. Oued Beth is situated on the Rharb plain, and it is here that Société Chérifienne des Pétroles has concentrated its search for oil during the past two years. The field has not been defined as a continuous reservoir and a great deal of drilling has been done in an effort to find and exploit the separated producing blocks. A total of 41 wells were drilled in the area during 1948, three of which were productive, bringing production at the close of the year to 260 barrels daily. It is expected that output will reach 600 to 800 barrels daily during 1949.

The company, which is jointly owned by the French and Moroccan Governments, has also drilled a number of other exploratory wells in the Rharb Basin, completing 16 wildcats outside of the Oued Beth area during the year to bring total drilling in Morocco to 57 wells, representing 174,450 feet of hole.

Seven drilling rigs are maintained in the country, all of which can be said to be engaged in exploratory work, since the Oued Beth field seems to be a peculiar feature on which each well is a wildcat. Five of the rigs have been purchased in the United States since the close of the war, and three of these are capable of drilling to depths below 10,000 feet.

Oil Production and Producing Wells in Morocco

Region and Field	Year of Discovery	Producing Oil Wells End of 1948			Crude Oil Production (Barrels)			
		Flowing	Art. Lift	Total Producing	Daily at End 1948	Year 1947	Year 1948	Cumulative Through 1948
Port Lyautey:								
Ain Hamra	1918	....	19	19	16	5,900	5,500	56,400
Bou Draa	1936	....	1	1	....	5,500	1,650	158,150
Oued Beth	1947	4	....	4	260	5,650	87,350	93,000
Tselfat	1934	....	1	1	....	3,960	1,000	125,960
Total	.....	4	21	25	276	21,010	95,500	433,510

NOTE: All operations by Société Chérifienne des Pétroles.

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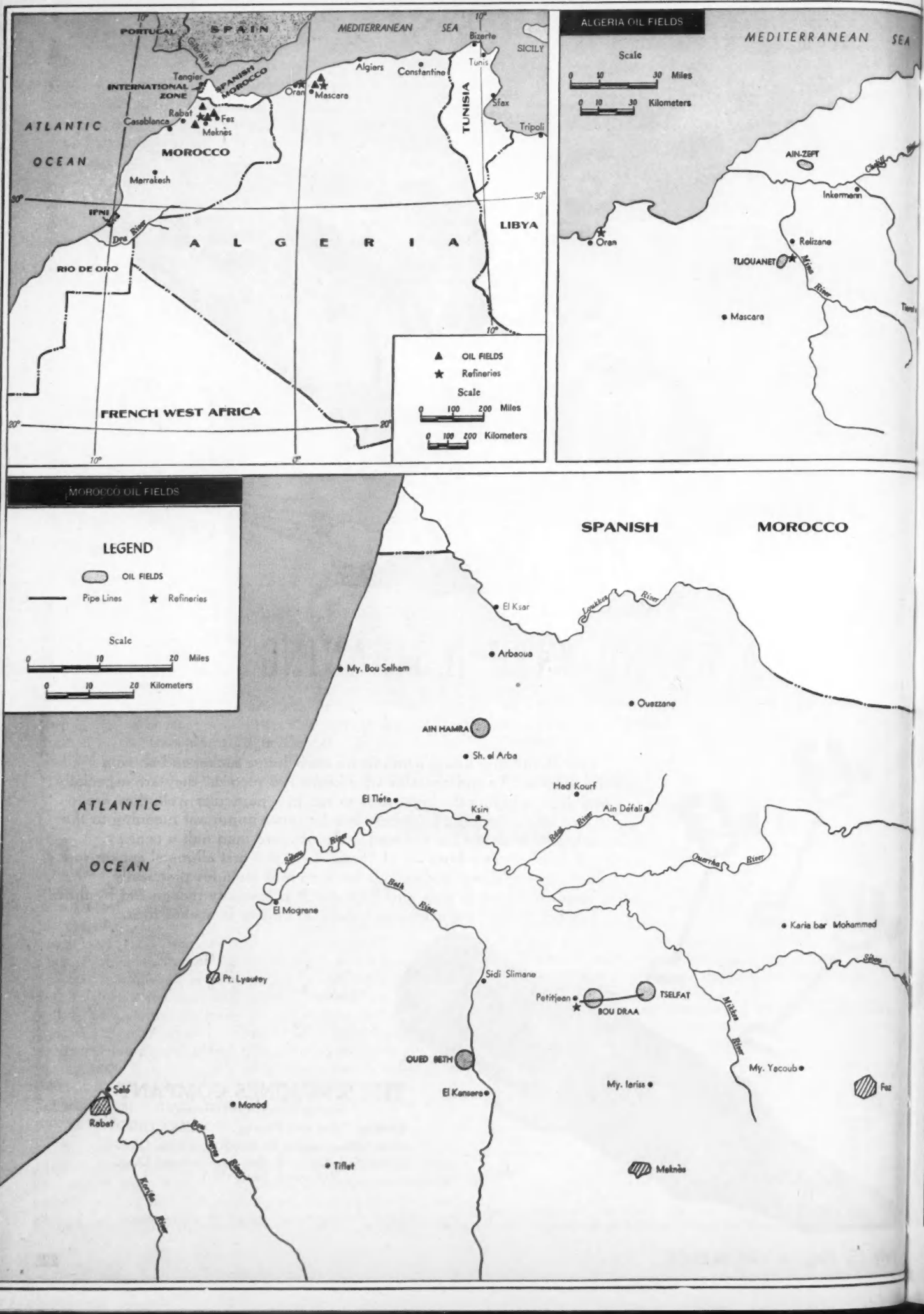
ALGERIA and MOROCCO



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MOROCCO—Continued

The only refinery operating in Morocco is located at Petitjean, near the Bou Draa field, capable of treating about 250 barrels of crude daily. Capacity is expected to be increased to 1000 barrels daily during 1949, through construction now in progress.

Pipe Lines in Morocco

COMPANY	Origin	Terminus	Length (Miles)	Diameter (Inches)	Capacity (Bbls. Daily)	Year Completed	Status
Société Chérifienne des Pétroles	Bou Draa	Petitjean	1	2	280	1940	In use
	Tselfat	Petitjean	12.3	2	280	1938	In use
	Ain Hamra	Karia (railway)	2.3	2	150	1943	In use
Total	3 lines		15.6		710		

Wildcats Completed in Morocco in 1948

Company, Area and Wells	Date Completed	Total Depth (Feet)	Results
Société Chérifienne des Pétroles			
Oued Beth (41 wells)	January to December	130,500	All wells reached the Primary beds 4 dry. 26 salt water. Shows of oil in 8. 3 productive (106 bbls., 41 bbls. and 24 bbls./day with chokes).
Koebia (4 wells)	March July October December	22,000	Dry (Miocene and Primary beds).
Merdja el Klab	August	8,550	Dry (Miocene and Cretaceous).
Karia Daouia	February	5,000	Dry (Miocene).
Sidi Kacem (5 wells)		4,300	Dry (Miocene).
Njara (5 wells)		4,100	Dry (Miocene).
Total .....57 wells		174,450	

Engineering and Geological Data on Morocco Fields

REGION AND FIELD	Proved Area (Acres)	Range of Gravity Oil A.P.I.	PRODUCING FORMATION			Depth (Feet)		Average Thickness of Pay (Feet)	Type of Structure
			Name	Kind	Age	Minimum to Top of Pay	Maximum to Bottom of Pay		
Port Lyautey:									
Ain Hamra	300	45	Tortonian	Sand	Miocene	400	4,500	10	Lenses
Bou Draa	340	45	Toarcian	Lime	Liasic	600	2,500	15	Anticline
Oued Beth	....	35	Primary	Lime and Sandstone	Primary	3,280	3,400	60	Faults
Tselfat	130	45	Toarcian-Domerian	Lime	Liasic	300	5,500	40	Anticline

TUNISIA

IN TUNISIA the Société d'Etudes et de Recherches Pétrolifères en Tunisie (SEREPT) continued its geological and geophysical operations in the central and northern parts of the country, and kept two heavy drilling rigs in operation, one at Cap Bon and the other at El Haroun.

One deep wildcat was completed on the El Haroun structure near Bizerte, being junked after reaching a depth of 9500 feet. Showings of gas were found, but there were no reports of oil.

Of particular interest during 1948 were applications by the Shell Group and by Gulf Oil Corporation for prospecting licenses. The latter company is said to be particularly interested in a concession for submerged land prospecting around the Kerbeuh and Djerba islands off the coast. Another application made during the year was that of the S.E.R.E.P.T. for a permit to prospect in the southern part of the protectorate. Early in 1949 the French Government announced it had granted the Gulf and Shell permits, each to have a 14-year concession on 9,000 square miles of territory to be operated as Tunisian companies.

OTHER AFRICA

THE search for oil is gradually spreading through the hitherto little-prospected regions of Africa, and active operations are now being carried on in a number of localities which have received little attention in the past. In Portuguese East Africa, the Mozambique Gulf Oil Company is carrying on an aerial magnetometer survey of a 42,000-square mile concession from a base established at Lourenco Marques. Between mid-July and November, half of the area had been photographed, and a third had been surveyed with the magnetometer. The preliminary survey is to be followed up with work on the ground.

In French Equatorial Africa the Government is sponsoring geological and geophysical studies of the Gabon coastal basin. A heavy rig was purchased in the United States during late 1947 for the first drilling, and one wildcat test, Mabora 1, was completed in April, reaching basement at 3600 feet. This test was located about 75 miles northeast of Port Gentil. Another well is now being drilled at Madiela, about the same distance to the southeast of Port Gentil, having reached a depth of 7000 feet by the end of the year. Late in the year a portable rig with 8000-foot capacity was received and was scheduled to start drilling geological holes early in 1949.

The French are also carrying on geological work in Madagascar, where crews have been working almost all of 1948. Before the war shows of heavy oil had been found in wells drilled near Tsimiroro.

Nigeria is the scene of active preliminary work which started early in 1948. D'Arcy Exploration Company has moved in a considerable amount of equipment and personnel, and is now engaged in reconnaissance work consisting of surface geology, gravitymeter surveys, and seismograph.

Spanish Morocco is being worked by an agency of the Spanish Government and by private Spanish companies. There has been some shallow drilling, some of which have had showings of gas. In addition the work carried on during 1948 has included surface geology, core drilling, gravitymeter and seismograph surveying.

In Uganda there has been a resumption of exploratory work started before the war. Showings had been found in wells drilled in 1939, and extensive seepages exist at several localities. Interesting structures have been worked out which will come in for more attention.

MIDDLE EAST—Summary

MIDDLE East crude oil production for 1948 rose to an average of 1.1 million barrels daily, an increase of 34 percent over 1947. While most of the Persian Gulf output moved to supply Western Europe, there were sharply rising import volumes into the United States, increasing from about 1000 barrels daily early in the year to 117,000 barrels a day at year end. At the same time exploratory drilling resulted in finding a number of new fields.

Delay was encountered on the various pipe line programs, projected and under construction, to transport Persian Gulf oil to the Eastern Mediterranean. Only Iraq Petroleum Company made substantial headway, laying all but 50 miles of the south leg of its new 16-inch line from the Kirkuk fields to Haifa, Palestine, and advancing work on the north leg, Kirkuk to Tripoli, Lebanon, at such a rate as to indicate completion of the new system by October, 1949. Arab political disturbances and pipe embargo delayed work on Trans-Arabian Pipe Line's carrier from the Saudi Arabia fields to Sidon, Lebanon. Plans by Middle East Pipe Line Company for a 31-inch line from the head of the Persian Gulf to the Syrian coast, were temporarily shelved, as were those of Iraq Petroleum Company for another 30-inch line direct from Kirkuk to the Mediterranean.

Despite limiting transportation facilities and a changing outlook in world demand, production increased in all Middle East countries except Iraq, half of whose normal production is shut in because of closure of the south leg of its pipe line system. Arabian American Oil Company announced a $520 million expansion program to 1953, and discovered new oil at Ain Dar in a wide step-out drilling venture. South of Ain Dar and northwest of Damman other discoveries have been indicated. Aramco at the close of 1948 announced it probably would reduce somewhat its 1949 output from the 142 million barrel total (390,000 barrels a day) of 1948. New discoveries in Egypt and Iraq and further drilling in Iran contributed to the rising Middle East production.

The close of 1948 indicated Middle East production already had passed a current optimum, since the Persian Gulf's 650,000 barrel a day flow into Western Europe was then more than enough to satisfy Europe's oil requirements. Middle East oil for Europe heavily reduced Western Hemisphere crude shipments to Europe, but was somewhat balanced by the larger Middle East shipments into the Western Hemisphere.

CYPRUS

PETROLEUM Development (Cyprus) Ltd., a subsidiary of Iraq Petroleum Company holds a concession on more than half of the island of Cyprus. Preliminary exploratory work in the form of geological and geophysical work has been carried on through 1947 and 1948, but no wells have been drilled. A detailed seismic study of the Mesoria Plain in central Cyprus apparently was unfavorable since early in 1949 it is reported that the permits will be surrendered.

IRAN

PRODUCTION of oil in Iran reached new peaks in 1948 when total output soared to 190,395,000 barrels, an increase of 22.8 percent over the 1947 yield. In so doing it maintained its position as the top producing nation of the Middle East region, and at the same time set a new all-time peak. At the close of the year its daily average output was 551,000 barrels daily, and during the latter part of the year it reached peaks when production over a 30-day period averaged nearly 590,000 barrels daily.

This output is maintained with a minimum of development, and at the close of the year only 77 wells were on produc-

Crude Oil Pipe Lines of Iran

COMPANY	Origin	Terminus	Length (Mi.)	Diam. (Inches)	Capacity (Bbls./ Day)	Year Completed	Status
Anglo-Iranian Oil Co., Ltd.	Masjid-i-Sulaiman	Abadan	133	10″ & 12″	80,000	1916-1917	Operating
	Haft Kel	Abadan	136	12″			
	Haft Kel	Marid	124	12″	205,000	1929 to 1938	Operating
	Haft Kel	Kut Abdullah	61	12″			
	Naft Safid	Wais	32	10″&12″			
	Agha Jari	Abadan	97	12″	176,000	1945 to 1948	Operating
	Agha Jari	Mashur	42	12″			
	Agha Jari	Mashur	48	20″ & 22″	150,000	1949	Building
	Gach Saran	Abadan	166	12″	40,000	1940	Operating
	Naft-i-Shah	Kermanshah	146	3″	2,600	1935	Operating
	Lali	Masjid-i-Sulaiman	40	8″/10″/ 12″	20,000	1948	Operating
	Naft Khaneh	Alwand	24	6″/4″	8,600	1927	Operating
Totals....			1,001		682,000		

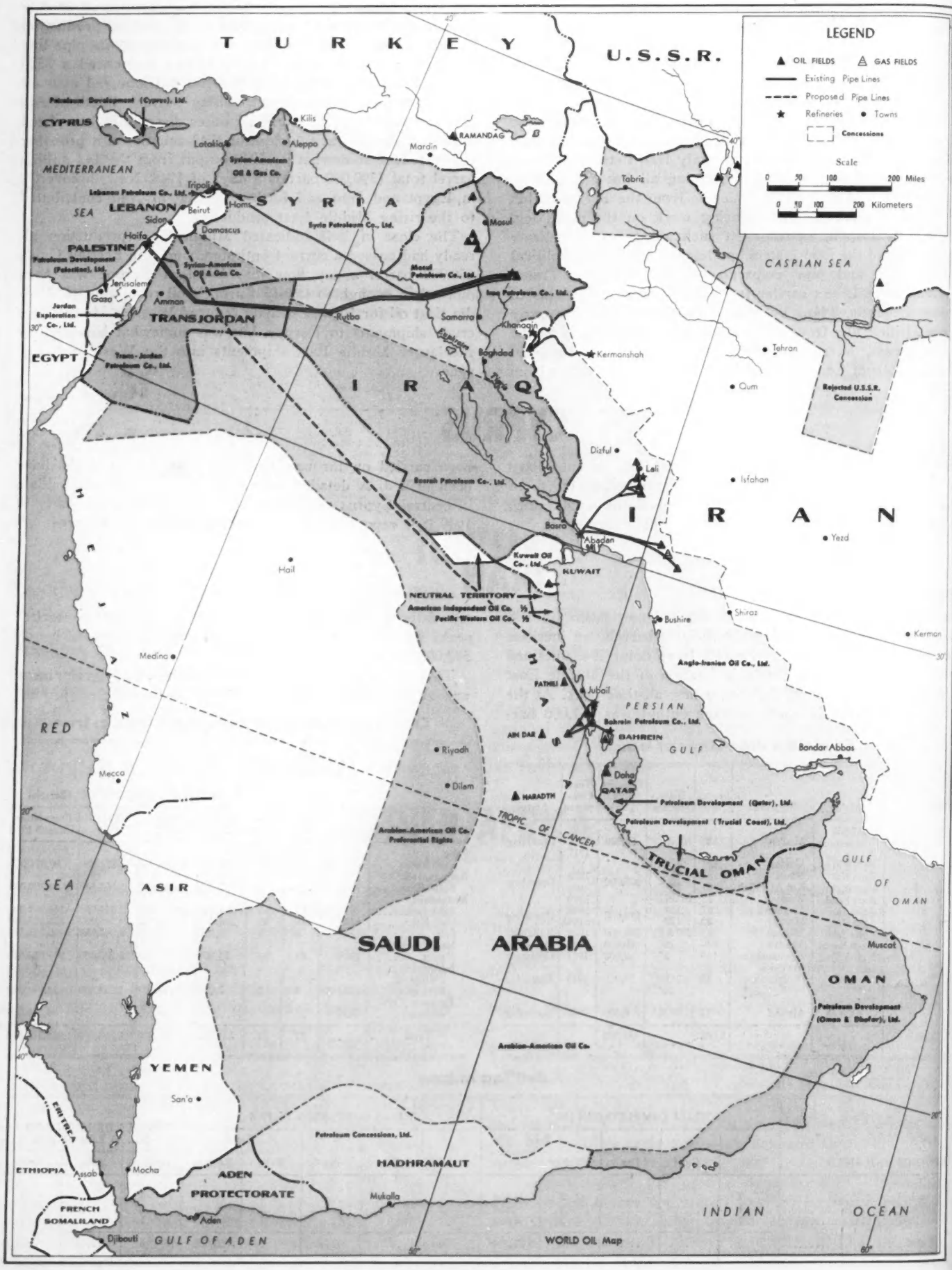
Oil Production and Producing Wells in Iran

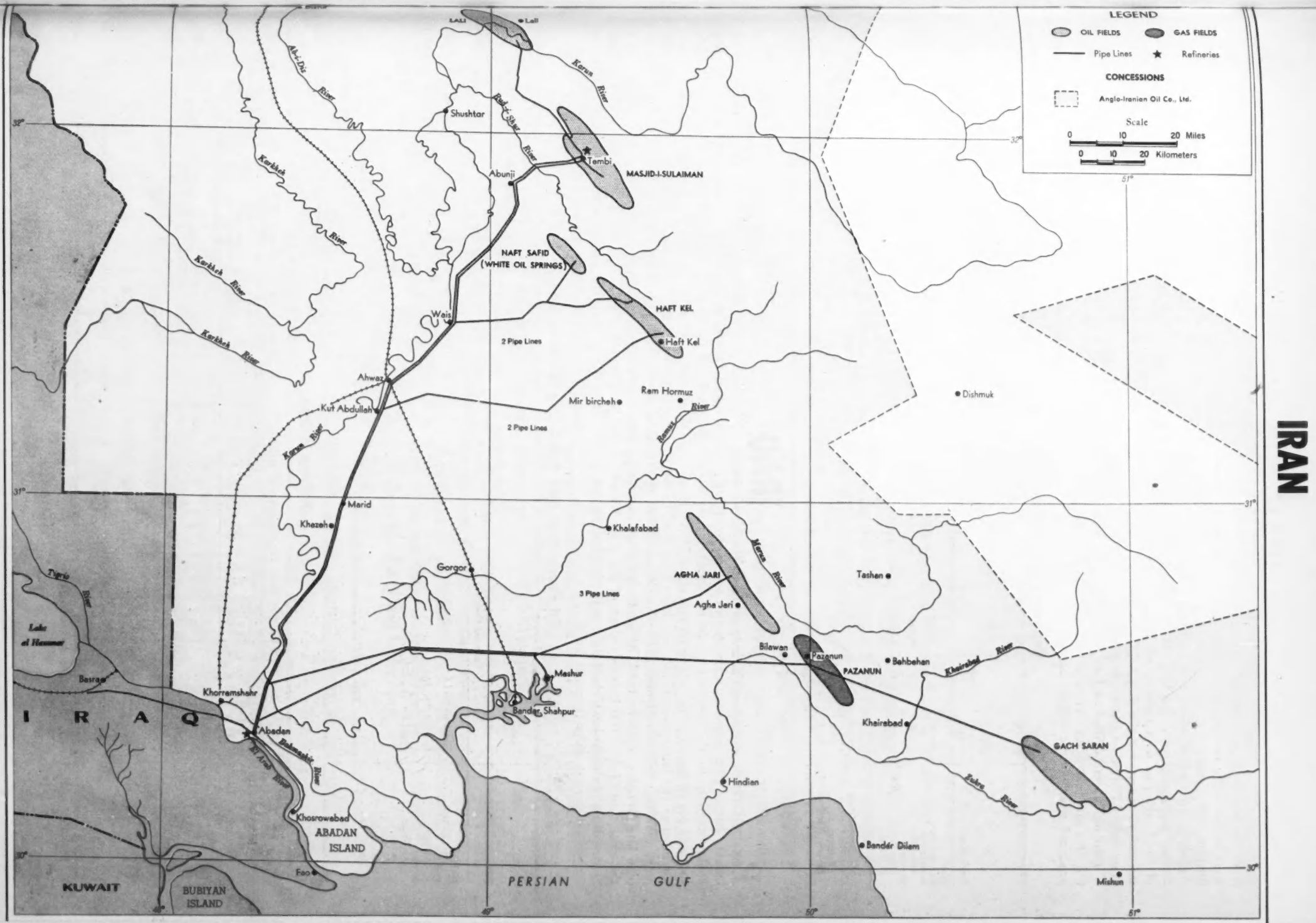
Province and Field	Year of Discovery	Producing Oil Wells End of 1948: Flowing	Producing Oil Wells End of 1948: Total Producing	CRUDE OIL PRODUCTION (Barrels): Daily End 1948	Year 1947	Year 1948	Cumulative Through 1948
Fars:							
Gach Saran.....	1928-37	3	3	39,000	13,142,200	14,814,000	90,614,000
Kermanshah:							
Naft-i-Shah.....	1923	2	2	3,500	1,044,300	1,165,000	10,765,000
Khuzistan:							
Agha Jari.....	1937-38	15	15	209,500	45,701,200	68,644,000	164,964,000
Haft Kel.....	1928	23	23	208,000	68,884,900	75,795,000	825,295,000
Lali.....	1946	3	3	13,000	18,300	2,963,000	2,981,300
Masjid-i-Sulaiman.....	1908	29	29	75,000	21,261,300	25,750,000	819,050,000
Naft Safid (White Oil Springs).....	1934-38	2	2	3,000	4,945,700	1,244,000	14,044,000
Pazanun (Condensate).....	1937	..	..	.....	.....	.....	6,500,000
Total.....	.....	77	77	551,000	154,997,900	190,395,000	1,932,213,300

Drilling in Iran

PROVINCE AND FIELD	WELLS COMPLETED IN 1947: Oil	Gas	Dry	Total: Wells	Footage	WELLS COMPLETED IN 1948: Oil	Gas	Dry	Total: Wells	Footage	WELLS DRILLING AND S.D. AT END OF 1948: Drilling	S.D.	Total
Khuzistan:													
Agha Jari.....	3	....	....	3	19,195	3	....	....	3	19,683	2	....	2
Lali.....	1	....	....	1	6,614	2	....	....	2	9,470	2	....	2
Naft Safid.....	1	....	....	1	6,335	1	....	....	1	6,455	1	....	1
Total.....	5	....	....	5	32,144	6	....	....	6	35,608	5	....	5

MIDDLE EAST—Concessions




LEGEND
OIL FIELDS
GAS FIELDS
Pipe Lines
Refineries
CONCESSIONS
Anglo-Iranian Oil Co., Ltd.
Scale
0 10 20 Miles
0 10 20 Kilometers
IRAN
IRAQ
KUWAIT
PERSIAN GULF
LALI
Lali
Shushtar
Tembi
MASJID-I-SULAIMAN
Abunji
NAFT SAFID
(WHITE OIL SPRINGS)
HAFT KEL
Haft Kel
Wais
2 Pipe Lines
Ahwaz
Kut Abdullah
Mir bircheh
Ram Hormuz
Dishmuk
Marid
Khezeh
Khalafabad
Gorgor
AGHA JARI
Agha Jari
3 Pipe Lines
Tashen
Bilawan
Pazanun
PAZANUN
Behbehan
Meshur
Bandar Shahpur
Khorramshahr
Abadan
Khairabad
Khairabad
GACH SARAN
Hindian
Bandar Dilam
Mishun
Fao
ABADAN ISLAND
BUBIYAN ISLAND
Lake el Hammar
Basra
Karkheh River
Karun River
Rud-i-Shur River
Ab-i-Diz River
Zohreh River
Bahmanshir River
Al Arab River
Tigris River
Ramuz River
Marun River
32°
31°
30°
48°
49°
50°
51°

IRAN—Continued

tion. Six new wells were drilled during 1948, three of which were in the Agha Jari field in preparation for additional production with completion of the new pipe line system from Agha Jari to Mashur where new terminal and storage facilities are being provided. The new system consists of 48 miles of 20-22 inch line with capacity of 150,000 barrels daily. At the end of the year Agha Jari field was producing at a rate in excess of 75 million barrels yearly.

Two wells were drilled at Lali during the year, and with the first full year of operation of the new pipe line the field produced nearly three million barrels.

Refineries of Iran

COMPANY	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Type of Refinery	Operating Status
Anglo-Iranian Oil Co., Ltd.	Abadan	500,000	125,000	Complete except for Lubes and Waxes	Operating
Kermanshah Pet. Co. (Anglo-Iranian)	Kermanshah	2,100	None	Skimming	Operating
Totals		502,100	125,000		

Engineering and Geological Data on Iran Fields

Province and Field	Proved Area (Acres)	Gravity Oil (API)	Name	Kind	Age	DEPTH (Feet) Minimum to Top of Pay	DEPTH (Feet) Maximum to Bottom of Pay	Average Thickness of Pay (ft.)	Type of Structure
Fars									
Gach Saran	38,400	33.0	Asmari	Lime	Olig-Miocene	4000	7000	1500	Anticline
Kermanshah									
Naft-i-Shah	3,840	42.8	Kalhur	Lime	Olig-Miocene	2600	2700	250	Anticline
Khuzistan									
Agha Jari	23,000	35.0	Asmari	Lime	Olig-Miocene	6000	9000	600	Anticline
Haft Kel	28,800	39.0	Asmari	Lime	Olig-Miocene	3000	4000	1000	Anticline
Lali	Not yet proved	35.2	Asmari	Lime	Olig-Miocene	5000	7000	1200	Anticline
Masjid-i-Sulaiman	34,500	38.0	Asmari	Lime	Olig-Miocene	2000	3000	1000	Anticline
Naft Safid (White Oil Springs)	6,400	36.0	Asmari	Lime	Olig-Miocene	5600	5700	1000	Anticline
Pazanun (Condensate)	6,400	Condensate	Asmari	Lime	Olig-Miocene	6000	8000	700	Anticline

IRAQ

PRODUCTION of crude oil in Iraq amounted to 26,446,246 barrels during 1948, representing a sharp decrease from 1947, due principally to the shutting down of operations on the southern leg of the pipe line, which terminates at Haifa. Runs for most of the latter part of the year have amounted to no more than half the normal output since only one-half of the pipe line facilities could be used. All of the production with the exception of 2,885,000 barrels output of the Naft Kaneh field, came from Kirkuk which at the end of 1948 was producing 46,304 barrels daily from 10 wells.

Pipe line construction designed to furnish an outlet for an additional 180,000 barrels daily is now under way, following the routes of the existing dual system to Haifa and Tripoli. The southern leg of the new 16-inch system has been completed to within 50 miles of its Mediterranean terminus at the time the outbreak of hostilities forced suspension of construction at the border of the present State of Israel. The northern leg had been pushed across the Iraq border and well into Syria at the close of the year, and current progress virtually assures completion before the end of 1949.

Oil Production and Producing Wells in Iraq

PROVINCE AND FIELDS	Operating Company	Year of Discovery	PRODUCING OIL WELLS END OF 1948 Shut In	Flowing	Art. Lift	Total Prod.	CRUDE OIL PRODUCTION (Barrels) Daily at End 1948	Year 1947	Year 1948	Cumulative Through 1948
Diyala:										
Naft Khaneh	Khanaqin Oil Co., Ltd. (Anglo-Iranian)	....	..	2	..	2	.....	.....	2,885,000	24,365,418
Kirkuk:										
Kirkuk	Iraq Pet. Co., Ltd.	1927	29	10	..	10	46,304	33,493,304	23,581,246	382,869,581
Mosul:										
Ain Zalah	Mosul Pet. Co., Ltd.	1940	14	..	..	..	.....	.....	.....	.....
Jawan		1933	4	..	..	..	.....	.....	.....	.....
Najmah		1933	20	..	..	..	.....	.....	.....	.....
Qaiyarah		1927	39	..	..	..	.....	.....	.....	.....
Qasab		1935	5	..	..	..	.....	.....	.....	.....
Total		....	111	12	..	12	46,304	33,493,304	26,466,246	407,234,999

Drilling in Iraq

PROVINCE AND FIELD	WELLS COMPLEYED IN 1947 Oil	Gas	Dry	Total Wells	Total Footage	WELLS COMPLETED IN 1948 Oil	Gas	Dry	Total Wells	Total Footage	WELLS DRILLING AND SHUT DOWN END 1948 Drlg.	S.D.	Total
BASRAH:													
Wildcats	..	..	..	..	.....	..	..	..	..	.....	3	..	3
DIYALA:													
Naft Khaneh	..	..	..	..	.....	1	..	..	1	2,064	1	..	1
KIRKUK:													
Kirkuk	4	..	..	8*	19,142	..	1	..	4†	17,403	2	..	2
Wildcats	..	..	..	..	.....	..	1	..	1	2,667	..	..	..
MOSUL:													
Ain Zalah	..	..	..	..	.....	2	..	2	4	17,098	2	..	2
Wildcat	..	..	..	..	.....	..	..	..	..	.....	1	..	1
Total	4	..	..	8	19,142	3	2	2	10	39,232	9	..	9

* Includes 4 observation wells. † Includes 3 observation wells.

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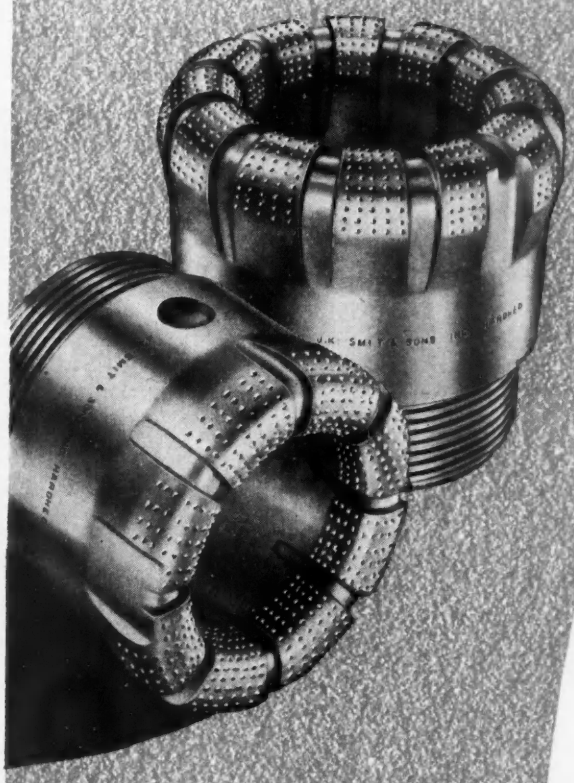

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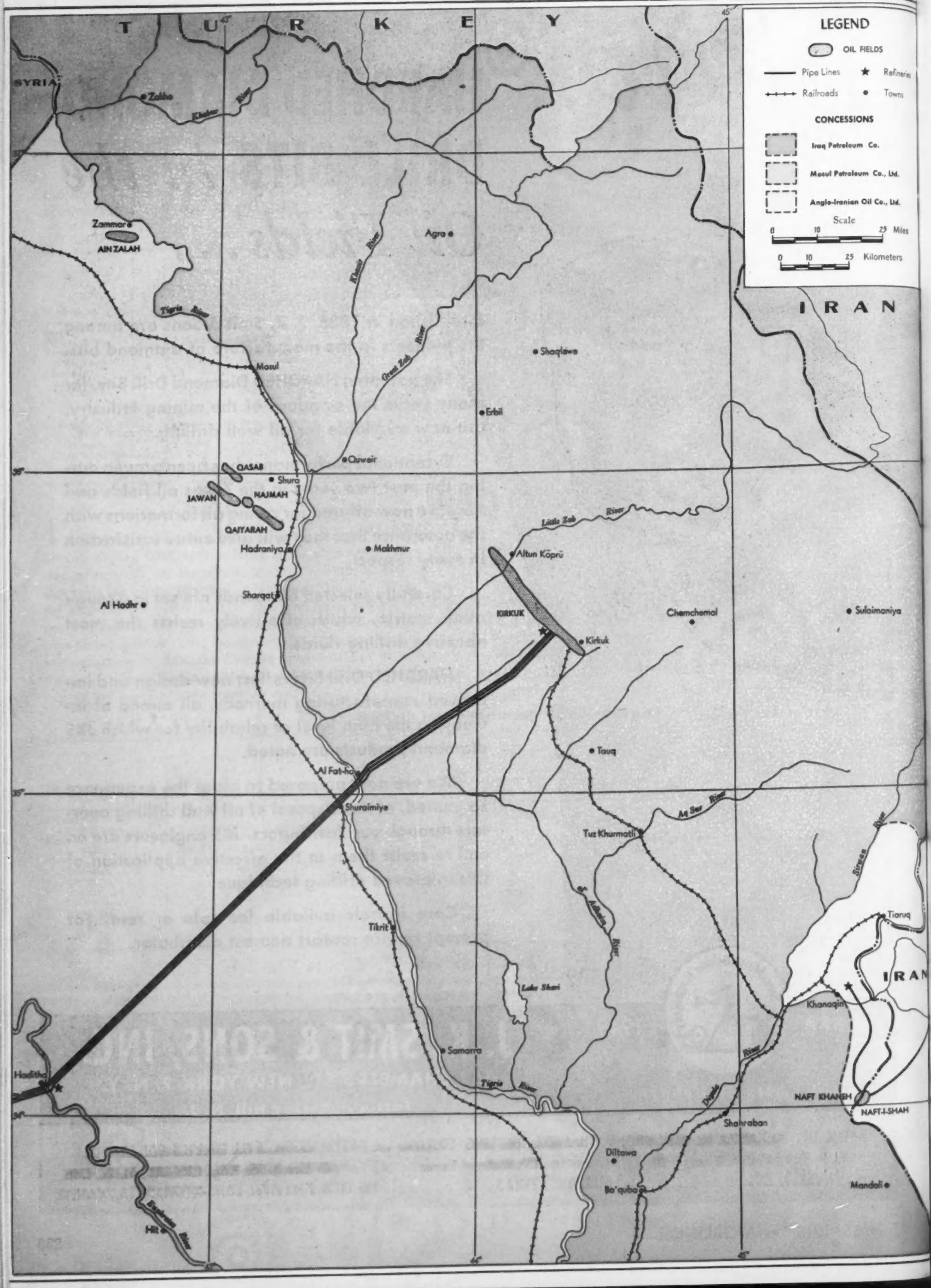
IRAQ


LEGEND
OIL FIELDS
Pipe Lines
Refineries
Railroads
Towns
CONCESSIONS
Iraq Petroleum Co.
Mosul Petroleum Co., Ltd.
Anglo-Iranian Oil Co., Ltd.
Scale
0 10 25 Miles
0 10 25 Kilometers
TURKEY
SYRIA
IRAN
Zakho
Khabur River
Zammar
AIN ZALAH
Agra
Khasir River
Tigris River
Great Zab River
Mosul
Shaqlawa
Erbil
Qaiwair
QASAB
Shura
JAWAN
NAJMAH
QAIYARAH
Hadraniya
Makhmur
Altun Köprü
Little Zab River
Sharqat
Al Hadhr
KIRKUK
Kirkuk
Chemchemal
Sulaimaniya
Tauq
Al Fat-ha
Shuraimiya
Tuz Khurmatli
Aq Sar River
Diyala River
Tikrit
Lake Shari
Tiaruq
Khanaqin
Samarra
Haditha
Tigris River
NAFT KHANEH
NAFT-I-SHAH
Shahraban
Diltawa
Ba'quba
Mandali
Euphrates River
Hit

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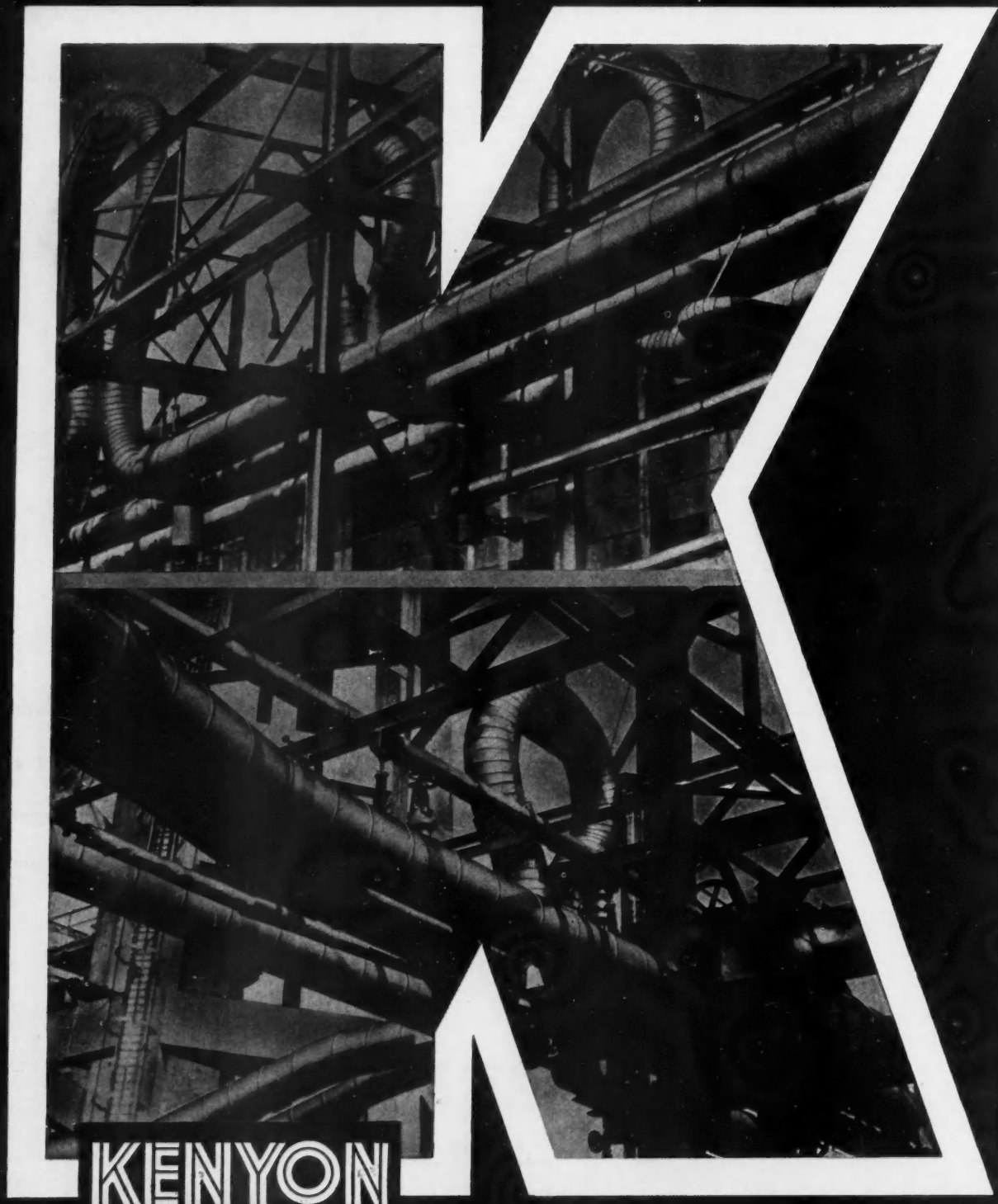

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IRAQ—Continued

Meanwhile the Iraq Petroleum Company group has been very active in drilling and exploration since the beginning of 1948. Geological and geophysical exploration has been carried on in many parts of the country, and wildcat drilling has indicated discovery of new producing areas. Although only one wildcat well was completed during the year, four rigs were running on wildcats at the end of the year. The completed well resulted in discovery of a new gas field at Bai Hassan, located on a structure running parallel to Kirkuk and about 6 miles to the southwest, the test was completed as a high-volume gas well at 2667 feet. During completion the well blew in out of control and was not closed in for eight days. No further wells were drilled in the area.

Two wildcats were drilled in the Basrah area of southern Iraq, neither of which were completed at the end of the year, but one of them indicated opening of a new field. Exploration is being carried out in the Mushorah Dagh area in northwestern Iraq, near the Turkish border, and one exploratory well was drilling at the end of the year. Elsewhere in the country, gravity and seismic work has been carried on and has resulted in location of a number of structures for future drilling.

Crude Oil Pipe Lines of Iraq

Company	Origin	Terminus	Length Miles	Diam. Inches	Capacity Bbls. Daily	Year Completed	Status
Iraq Pet. Co., Ltd.	Kirkuk	Haifa	620	12¾"	90,000 B.P.D.	1934	Idle
	Kirkuk	Tripoli	530	12¾"		1934	In Use
	Kirkuk	Haifa	620	16"	180,000 B.P.D.	....	Building
	Kirkuk	Tripoli	530	16"		....	Building
	Kirkuk	Banias	556	28"-32"	275,000	....	Planned

Refineries of Iraq

Company	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Daily Crude Runs End of 1948 (Bbls.)	Type of Refinery	Operating Status
Iraq Government	Baiji	....	....	.....	.....	Planned
Iraq Petroleum Co., Ltd.	K-3 Station	1,500	None	.....	Skimming	Operating
	K-3 Station	6,450	None	.....	Skimming	Building
	Kirkuk	1,500	None	.....	Skimming	Operating
	Kirkuk	2,280	None	.....	Skimming	Building
Khanaqin Oil Co., Ltd.	Alwand	7,500	None	.....	Skimming	Operating
Total	.....	19,230	None			

Engineering and Geological Data on Iraq Fields

Province and Field	Proved Area (Acres)	Range of Gravity Oil (API)	Name	Kind	Age	DEPTH (Feet) Minimum to Top of Pay	DEPTH (Feet) Maximum to Bottom of Pay	Average Thickness of Pay (ft.)	Type of Structure
Diyala:									
Naft Khaneh	....	42.8	Asmari	Limestone	Mio-Eoc.	3000	....	200-300	Anticline
Kirkuk:									
Kirkuk	83,500	36	Quarah Chauq	Limestone	Eoc.-Mio.	950	3200	800	Closed Anticline
Mosul:									
Ain Zalah	3,600	32	Ain Zalah	Limestone	Cret. or Mio.	5000	6000	200	Closed Anticline
Jawan	8,500	20	Main Limestone	Limestone	Miocene	700	1000	600	Anticline
Najmah	2,000	20	Main Limestone	Limestone	Miocene	700	1000	600	Anticline
			Pilsner	Limestone	Upper Cret.	1500	1800	300	Anticline
Qaiyarah	12,000	20	Shallow Zone	Limestone	Miocene	....	....	....	Anticline
			Main Limestone	Limestone	Miocene	700	1000	600	
Qasab	3,900	20	Main Limestone	Limestone	Miocene	700	1000	600	Anticline
			Pilsner	Limestone	Upper Cret.	1500	1800	300	

KUWAIT

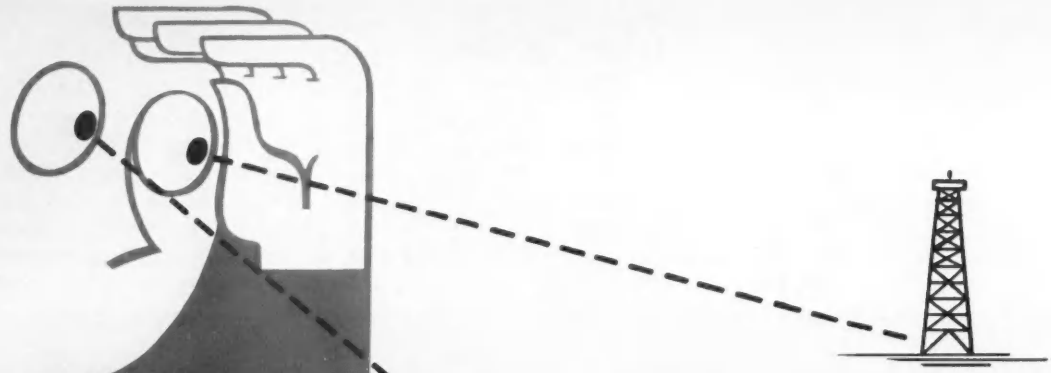
FEW of the world's oil-producing areas have seen such a phenominal expansion in potential as has been evidenced by Kuwait's Burghan field during the past two years, and particularly during 1948. A little more than a year ago its proved area was only 6500 acres, and production amounted to only 62,000 barrels daily at the beginning of 1948. At the end of 1948, through completion of 24 wells during the year, all of which were producers, the area has been expanded to more than 22,000 acres, and daily average yield has reached 212,000 barrels a day. Where there were 13 producing wells at the beginning of the year, there are now 37 producers, and the daily average offtake is restricted more by the facilities for handling and shipping crude oil than by the ability of the wells to produce. Most of the wells are dual-zone completions from two separate sands in the middle Cretaceous formations. Early in 1949 production had continued to mount until it approached 275,000 barrels daily. Nine rigs were running in the field at the end of 1948, and two more are reported to have been placed in operation within the first two months of 1949. The first commercial production was drawn from the field on June 30, 1946, and during the first 2½ years a total of 68,702,680 barrels of oil has been produced. Estimated reserve is in excess of 10 billion barrels, the greatest concentration of reserve of any single field in the world.

Burghan field was discovered in 1938, but only a few wells had been drilled before the operations were halted and the wells cemented up as a security measure during the war. First postwar work consisted largely of rehabilitation of installations and re-drilling the old wells, and concentrated drilling operations only got under way during 1947 and 1948.

Much work has been done during 1948 on construction of housing, warehousing facilities, pipe line gathering system, gathering stations and storage tanks, and tanker loading docks. Recently a seismograph party has gone to work outside the field, and it is understood that one and perhaps two rigs will be assigned to exploratory drilling.

Salient Data on Burghan Field

Operating Company	Kuwait Oil Co., Ltd. (Gulf Oil Corporation and Anglo-Iranian)
Year of Discovery	1938
Producing Wells—Flowing	37
Pumping	
Production in 1947	16,227,093 bbls.
Production in 1948	46,546,795 bbls.
Cumulative Production to end of 1948	68,702,680 bbls.
Daily production at end of 1948	212,000 bbls.
Wells Drilled in 1948—Oil	24
Gas	None
Dry	None
Total Wells	24
Field Wells Drilling—End of 1948	9
Estimated Proven Area of Field	22,000 acres
Gravity of Oil (A.P.I.)	32.5
Producing Formation—Local Name	.....
Kind	Sand
Age	Cretaceous
Minimum Depth to top of pay	3272 feet
Maximum depth to bottom of hole	4818 feet
Average Thickness of Pay	350 feet
Type Structure	Antieline
Concession Area	3,839,996 acres (all of Kuwait)



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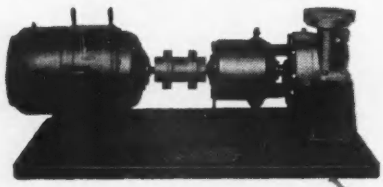
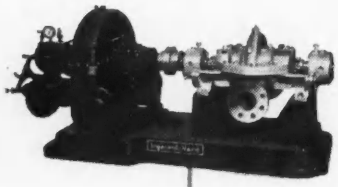
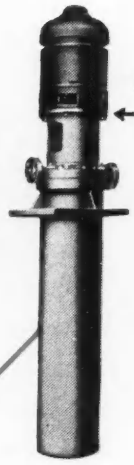


Horizontally-split, single-stage for pressures to 450 psi



Vertical, multi-stage for pressures to 1700 psi



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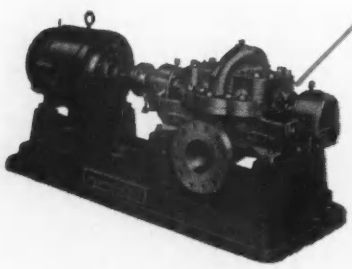
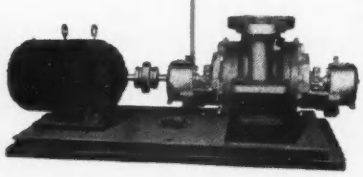
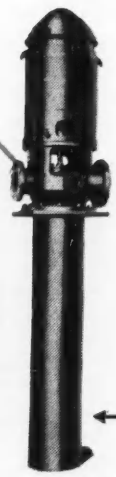


Horizontally-split, tow-stage for pressures to 500 psi



Vertically-split, two-stage for pressures to 600 psi



Mixed-flow vertical for pressures to 600 psi

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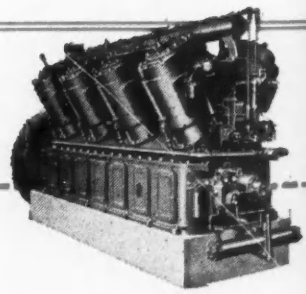
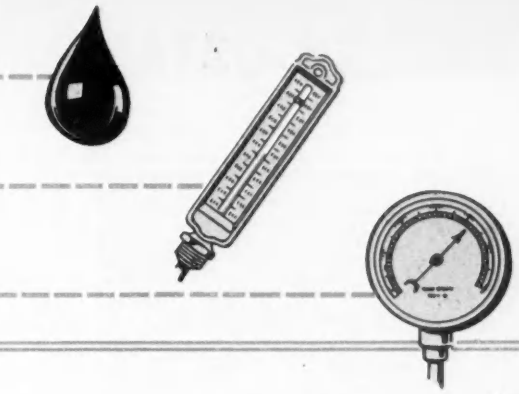
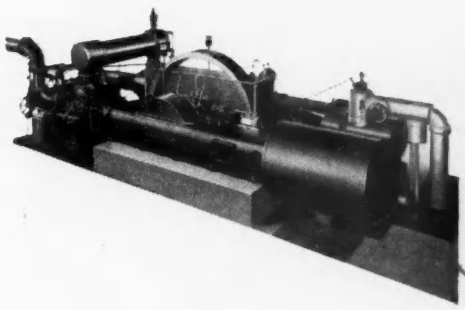




Steam-driven compressors, hp sizes to 3000



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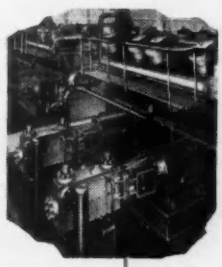
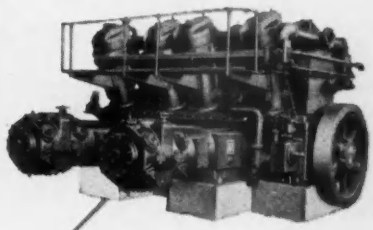
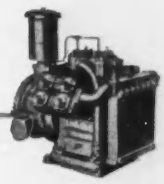


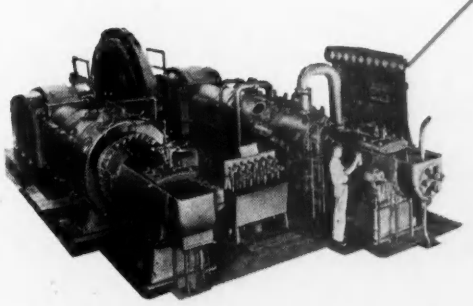
4-cycle gas-engine-driven compressors for pressures to 6000 psi 75 to 1200 hp sizes



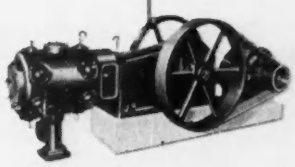
or the **COMPRESSOR**

Air-cooled compressors, ½ to 90 hp

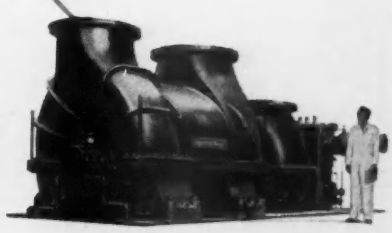




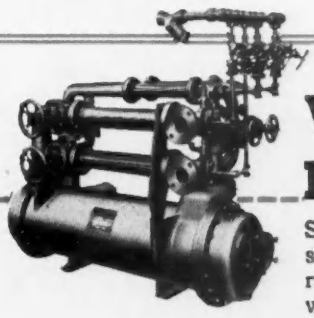
Synchronous motor-driven compressors, pressures to 15,000 psi 75 to 3000 hp sizes



Belt-driven compressors for pressures to 3000 psi, 5 to 300 hp sizes



Centrifugal Blowers for pressures from ½ to 100 psi —2 to 30,000 hp sizes



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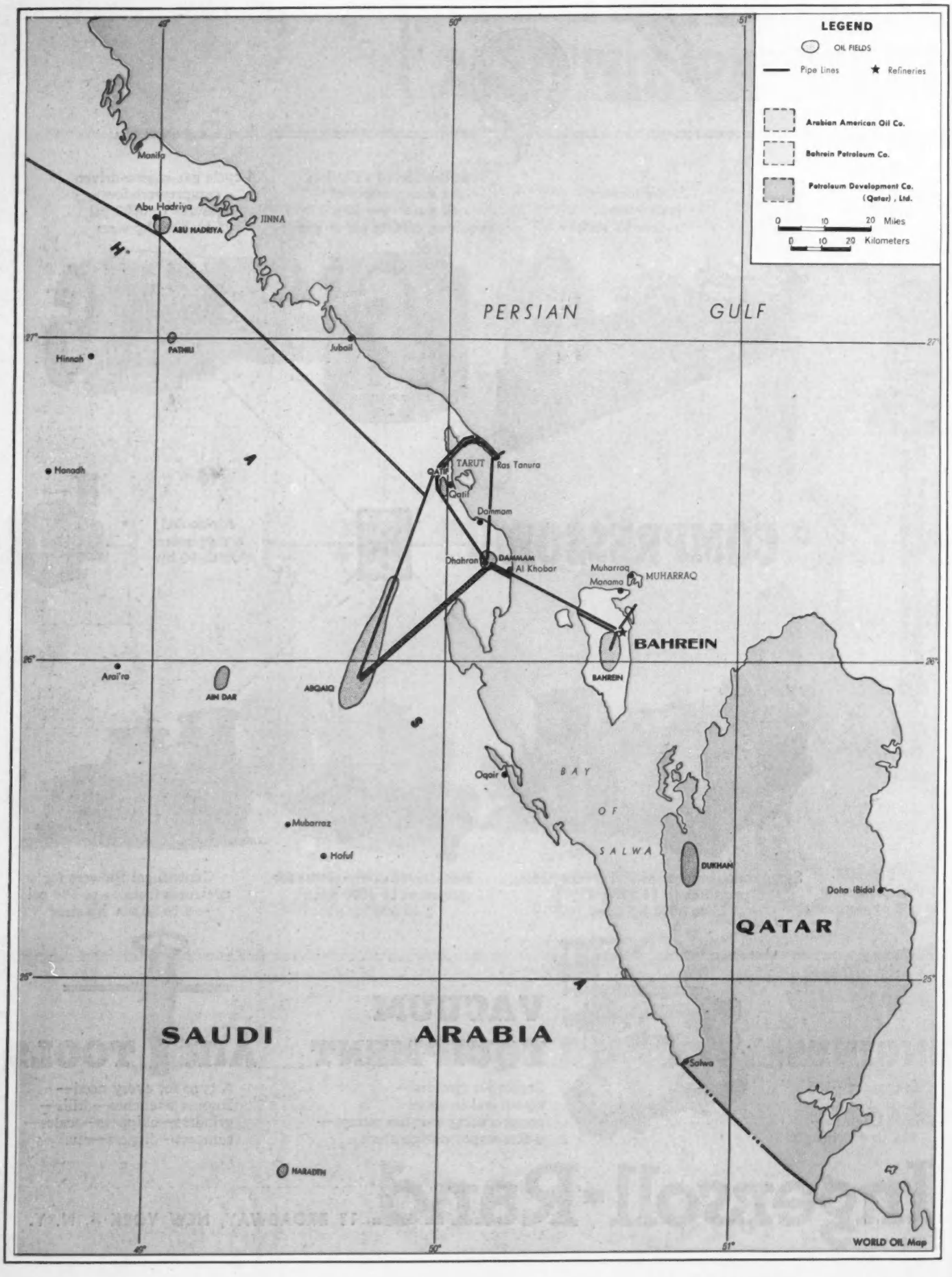
SAUDI ARABIA - BAHREIN - QATAR



LEBANON

ACTIVITY in Lebanon was carried on by Lebanon Petroleum Company, another of the Iraq Petroleum Company subsidiaries. Geological work started in 1947 was continued in 1948, but no new locations have been announced since completion of the company's Terbol 1, deep wildcat test near Tripoli, as a dry hole at 10,059 feet.

NEUTRAL ZONE

CONCESSION rights have been granted on the Neutral Zone between Kuwait and Saudi Arabia. The former's half interest was obtained by American Independent Oil Company, and Saudi Arabia's interest was granted early in 1949 to J. Paul Getty's Pacific Western Oil Corporation. The principals have not indicated what form of operating agreement will be set up to prospect the 50 by 45 mile area, lying directly between the producing areas of Kuwait and Saudi Arabia.

PALESTINE

PETROLEUM Development (Palestine) Limited's operations were hampered during 1948 by political disturbances lasting throughout the latter part of the year. Huleiqat 1, a wildcat northeast of Gaza had reached a depth of 3464 feet when it was forced to shut down. A wildcat planned on the Kurnub structure south of the Dead Sea has been held up, and the Consolidated Refineries, Ltd. plant at Haifa has been closed most of the year.

QATAR

PETROLEUM Development Company (Qatar) Ltd., another Iraq Petroleum Company subsidiary, resumed operations on Qatar peninsula during the latter part of 1947, and by the end of 1948 had completed three new oil wells in the Dukhan field. This brings to five the number of producible wells which now await completion of a pipe line outlet. Two producers drilled during 1940 had been plugged as a security measure during the war, and these have been reconditioned. Production at Qatar is from Kerkrit Lime, equivalent to the Arab limestone producing in Saudi Arabia; found at a depth of 5600-6050 feet.

Work was to start soon after the beginning of 1949 on construction of a 60-mile 12-inch pipe line, northeastward across the peninsula to a Persian Gulf loading terminal.

SAUDI ARABIA - BAHREIN

DEVELOPMENTS in Saudi Arabia during 1948 have served to further enhance its position as one of the outstanding concentrations of oil in the world today. Drilling in Abqaiq field has expanded its areal limits as well as its producing potential, further development at Qatif has added to its value as a source of crude, and in addition the program of exploratory drilling on which Arabian American Oil Company embarked during the past year has been outstanding in its success. The year also saw final consummation of the deal whereby Standard Oil Company (N.J.) and Socony-Vacuum Oil Company became partners in the Arabian American Oil Company along with Standard Oil Company of California and The Texas Company.

Production of crude oil during 1948 totaled 142,852,989 barrels, or 59 percent more than 1947 output. At the end of the year it was producing at a rate of 466,400 barrels daily, and during the first months of 1949 production remained above 520,000 barrels daily. This output was from no more than 70 wells, and there are 14 wells in the Abqaiq field alone which have not been placed on production.

Drilling during the year resulted in completion of 24 wells, 18 of which were at the great Abqaiq field, four were in the Qatif field, and two were in the newly discovered Ain Dar field, 30 miles west of Abqaiq, which came in during the middle of the year with every indication that it will be of major importance although it has not yet been provided with an outlet. The discovery well had 250 feet of pay section in the Arab lime from which Abqaiq produces, and the second well was also a producer located 18,000 feet south of the discovery.

Development drilling at Abqaiq has borne out earlier predictions that the Buqqa area, northeast of Abqaiq would be merely an extension of the main structure which now has a proved area 30 miles long and covering 66,000 acres.

Seven rigs are now running in Saudi Arabia, three of which are engaged in development drilling in Abqaiq field, one at Qatif, one at Ain Dar and two on wildcats. The two wildcats, Fathili 1, about 59 miles northeast of Dammam, and Haradth 1, about 170 miles southwest of Dammam were still drilling at the end of the year, but early in 1949 had both had shown every indication that they would open new producing areas.

Construction is proceeding on the 30-31 inch pipe line. At the end of the year 146 miles of line, originating in the

Oil Production and Producing Wells in Saudi Arabia and Bahrein

Country and Field	Operating Company	Year of Discovery	PRODUCING OIL WELLS END OF 1948				CRUDE OIL PRODUCTION (Barrels)			
			Shut In	Flowing	Art. Lift	Total Prod.	Daily at End of 1948	Year 1947	Year 1948	Cumulative Through 1948
SAUDI ARABIA:										
Abqaiq	Arabian American Oil Company	1940	14	34	..	34	365,200	53,659,715	105,902,423	138,023,046
Ain Dar		1948	2	..	..	..	.....	.....	.....	.....
Abu Hadriya		1940	1	..	..	..	.....	.....	.....	.....
Dammam		1936	3	31	..	31	91,300	34,816,451	33,426,992	189,867,477
Qatif		1945	1	5	..	5	9,900	1,375,479	3,523,574	7,415,498
Total		.....	21	70	..	70	466,400	89,851,645	142,852,989	335,306,021
BAHREIN:										
Bahrein	Bahrein Petroleum Co. Ltd.	1932	..	66	..	66	29,984	9,410,710	10,914,905	98,914,071

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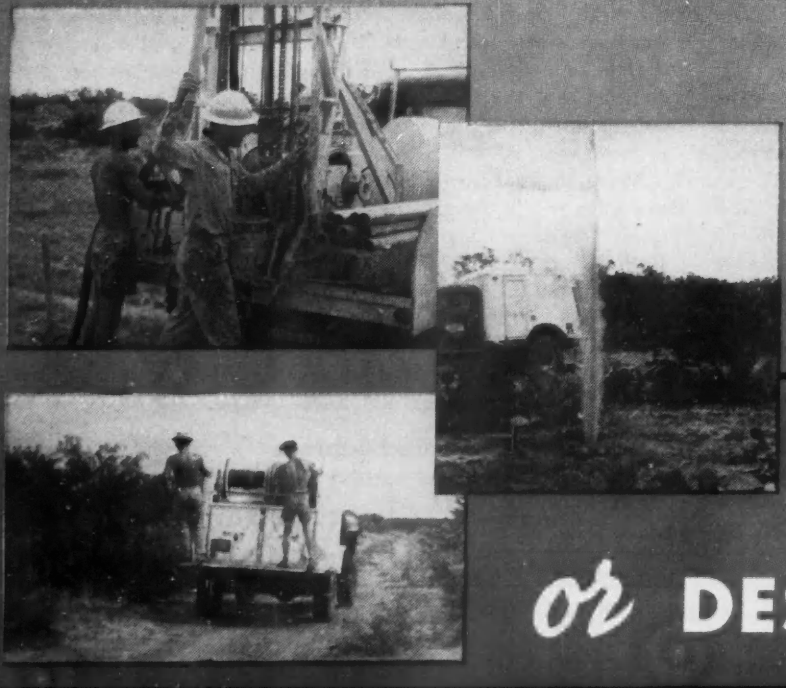

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SAUDI ARABIA - BAHREIN - Continued

Abqaiq field had been completed and was being used to deliver oil to the Ras Tanura refinery area.

Meanwhile geological and geophysical work, consisting of two surface mapping parties, two gravity meter parties, one seismograph crew and three structure drill crews has gone forward throughout the year. One gravity party has been devoting time during the year to a survey of offshore marine areas in the Persian Gulf.

The Bahrein field, on Bahrein Island, produced 10,914,905 barrels of crude oil during the year, and at the end of the year was accounting for a daily output of 29,984 barrels. No new wells were drilled during the year, but at the end of the year one rig was operating, drilling a deep well to test lower formations. At the close of the year it had reached a depth of 5225 feet and had penetrated the fourth potential producing horizon. Currently there are 66 wells producing at the highest rate in the history of the field.

The refinery at Bahrein, supplied by submarine lines from the mainland fields as well as by output from the Bahrein field itself, has a nominal capacity of 153,500 barrels daily, and maintained an average throughput during 1948 of slightly more than 150,000 barrels daily.

Engineering and Geological Data on Saudi Arabia and Bahrein Fields

Country and Field	Proved Area (Acres)	Range of Gravity Oil (API)	Name	Kind	Age	Depth (Feet) Minimum to Top of Pay	Depth (Feet) Maximum to Bottom of Pay	Average Thickness of Pay (Ft.)	Type of Structure
SAUDI ARABIA									
Abqaiq	66,000	19-38	Arab	Lime	Jurassic	5,600	7,400	210	Anticline
Abu Hadriya	Unknown	.....	Hadriya	Lime	Jurassic	10,000	10,220	110	Anticline
Ain Dar...	Unknown	38	Arab	Lime	Jurassic	6,585	7,200	250	Anticline
Dammam...	9,000	34-68	Bahrein	Lime	Cretaceous	1,600	2,300	.....	Faulted
			Arab	Lime	Jurassic	4,400	4,900	325	Anticline
Qatif..	Unknown	29-38	Arab	Lime	Jurassic	7,100	7,500	187	Anticline
BAHREIN									
Bahrein	10,000	33.5	Arab	Lime	Jurassic	2,000	2,250	.....	Elongated Dome
						4,000	4,600	.....	

Crude Oil Pipe Lines of Saudi Arabia

Company	Origin	Terminus	Length (Miles)	Diameter (Inches)	Capacity	Year Completed	Status
Arabian American Oil Co.....	Abqaiq	Dhahran	40	14	110,000	1947	Operating
	Abqaiq	Dhahran	40	12 & 14	100,000	1946	Operating
	Abqaiq	Ras Tanura	65	30-22-20	300,000	1918	Operating
	Dhahran	Ras Tanura	23	12	123,000	1946	Operating
	Dhahran	Ras Tanura	39	10	65,000	1939	Operating
	Dhahran	Bahrein	34	12	110,000	1945	Operating
Trans-Arabian Pipe Line Co.	Abqaiq	Mediterranean Coast	1100	30 & 31	330,000	....	Building

EFINED PRODUCTS LINES Ras Tanura Terminal to loading wharf.

Refineries in Saudi Arabia and Bahrein

Company	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Daily Crude Runs End of 1947 (Bbls.)	Type of Refinery	Operating Status
SAUDI ARABIA						
Arabian American Oil Co.....	Ras Tanura	140,000	None	115,000	*Skimming	Operating
BAHREIN						
Bahrein Petroleum Co.....	Bahrein Island	153,500	Thermal cracking 14,900 Thermal reforming 13,000	140,000	S-C-A	Operating

* Complete distillation and reforming but without cracking, lube, wax or asphalt plants.

Drilling in Saudi Arabia and Bahrein

COUNTRY AND FIELD	WELLS COMPLETED IN 1947 Oil	Gas	Dry	Total Wells	Total Footage	WELLS COMPLETED IN 1948 Oil	Gas	Dry	Total Wells	Total Footage	WELLS DRILLING AND SHUT DOWN END 1948 Drlg.	S.D.	Total
SAUDI ARABIA													
Abqaiq	17	....	1	18	104,228	18	..	..	18	117,471	3	..	3
Ain Dar (1948 Discovery)	..	..	..	..	.....	2	..	..	2	14,100	1	..	1
Buqqa	3	..	..	3	22,895	..	Included with Abqaiq						
Dammam	1	..	..	1	3,270	..	..	..	..	.....	....	..	..
Qatif	1	..	1	2	12,831	4	..	..	4	25,792	1	..	1
Wildcats	..	..	..	..	.....	..	..	..	..	.....	2	..	2
Total	22	..	2	24	143,224	24	..	..	24	157,363	7	..	7
BAHREIN													
Bahrein	6	..	..	6	13,660	..	..	..	..	.....	1	..	1

SYRIA

SYRIA has been one of the most active of the non-producing Middle East countries. In recent years at least five wildcats have been drilled in Syria deep enough to test formations to the Cretaceous and deeper. During 1948 Petroleum Development (Syria and Lebanon) Ltd. abandoned its Bafloun 1, 30 miles northwest of Aleppo at 8666 feet without reporting important shows. At the close of the year two other wildcats were drilling: Dolaa 1, 95 miles southeast of Aleppo in the central desert area, was drilling below 10,163 feet. The company's Toual Abba 1, in north central Syria, about 155 miles east of Aleppo and near the Turkish border, was drilling surface formations at the end of the year.

Since the close of the year the Cabinet has ratified contract for Trans-Arabian Pipe Line's transit rights, but still has to ratify an agreement under which a 22,000-square mile concession relinquished by Petroleum Development may be taken up by Syrian-American Oil & Gas Co., headed by J. W. MenHall, a Syrian-born American.

TRANSJORDAN

TRANSJORDAN Petroleum Company, an I.P.C. subsidiary has spent most of 1948 carrying on geophysical and geological work on its 28,000 square mile concession obtained in 1947, but has not yet started any drilling operations. During the past year most of the emphasis has been on preliminary surface geology and operation of one gravity crew.

TURKEY

TURKEY'S new oil industry is under the direction of the Maden Tetkik ve Arama Enstitutu, (Mining Research and Exploration Institute) and although there have been reports of possible invitations to foreign operators to take part in the exploratory and development program, the Government agency has denied that any such action will be taken.

The first oil was produced in Turkey in 1940 when a well in the Ramandag area produced for a short time at a rate of 70 barrels a day, but failed to hold up. Subsequent wells showed small amounts of heavy oil, but nothing of commercial value was developed until the early part of 1947, when Raman 9 came in making an estimated 300 barrels of oil daily, swabbing from a depth of 4400 feet. It was not placed on production until March, 1948. Later this well and Raman 8 an earlier test, were acidized with marked increase in yields and decision was made to concentrate operations on the development of this field to the point where a substantial part of Turkey's domestic needs might be met from local sources. Four rigs have been operated in the field, but completions have been rather slow. At the end of the year there were three producing wells, a third well has found the pay and set casing, and two other tests were drilling. The actual drilling operations have been handled for the past two by Drilling and Exploration Company.

A small topping plant exists in the field, with nominal capacity of 200 barrels daily, and another, 350-barrel unit is now under construction. During the course of 1948 some 25,000 barrels of the 15-gravity Raman oil were produced and refined. An important product is asphalt for road construction.

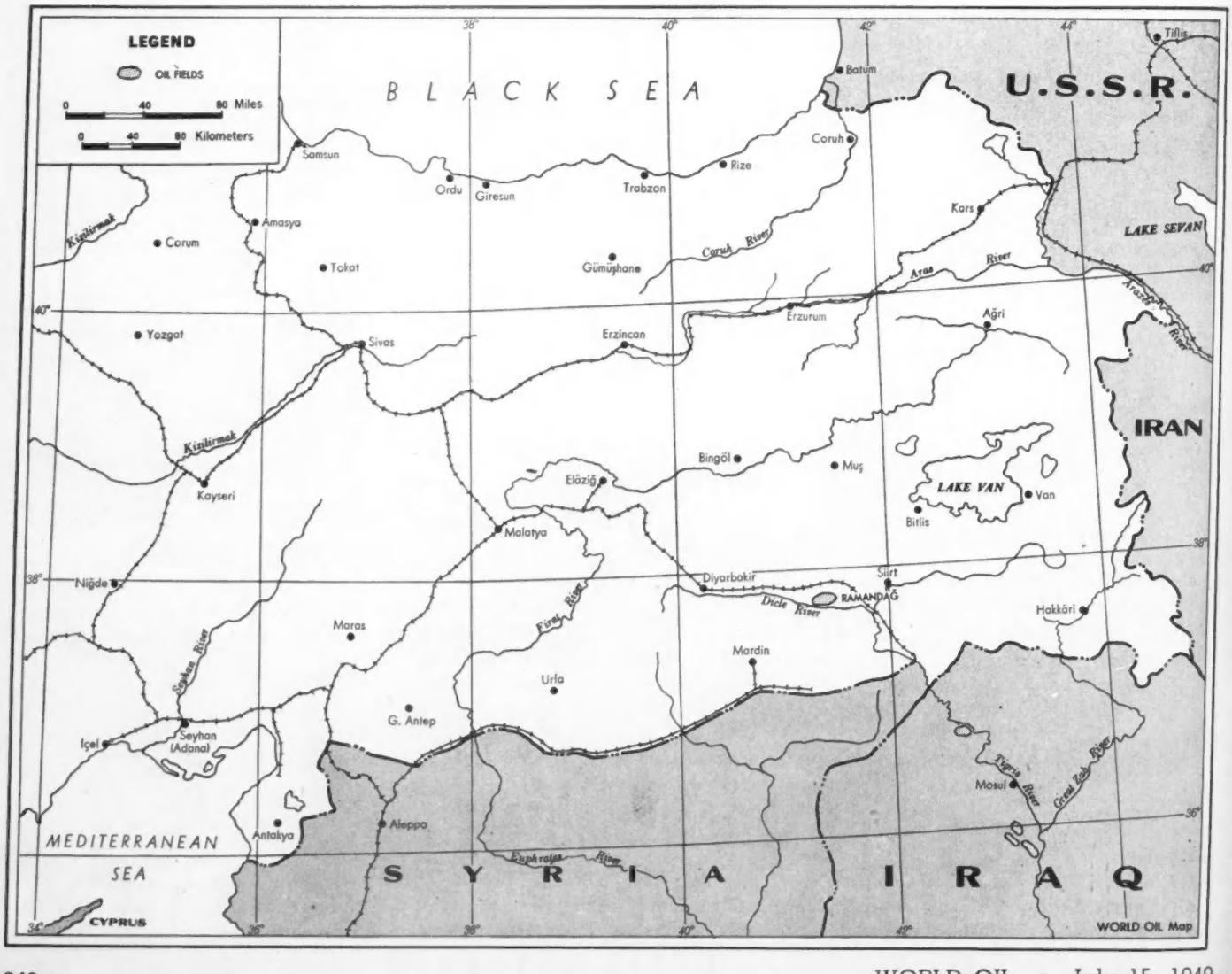
A considerable amount of interest has been shown in the Adana basin, in South Central Turkey, near the Mediterranean coast, where geological parties and seismograph geophysical crews operated during most of the year. For the time being no actual drilling is in prospect for this region, although the exploratory work will continue in an effort to outline structures for later drilling. There has also been some interest in the areas outside the Raman field between Raman and Diyarbakir, in the Tigris Valley of southeastern Turkey where geological and geophysical work has been done during 1948.

Outside of the above areas there has been geological work along the Black Sea coast in the region of Mapavri where the existence of seepages has been known for a number of years.

The M.T.A. has been operating a seismic and gravity crew during the year in the Adana basin, but a large part of the geophysical work is being done by United Geophysical Company, working for the agency. At least one structure located by surface geology and tested by a resistivity survey has been confirmed by seismograph detail work.

The Raman field produces from an average depth of 4500 feet, from a pay in the upper part of a massive Cretaceous limestone.

Southwestern Area



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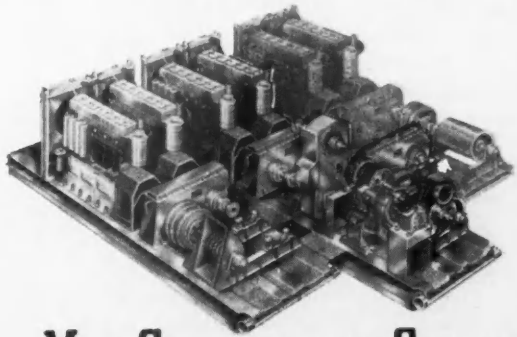

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BURMA

THE oil industry in Burma received setbacks as a result of World War II as great as was experienced by any other nation in the world. The difficulties arising from destruction of facilities by two factions have been added to by continued civil strife since the close of the war. Therefore, although a considerable amount of rehabilitation has been possible in other areas of the world, the oil areas of Burma are still far from a return to normal.

During 1948 total output from Burma's oil fields amounted to 300,000 barrels, or less than 1000 barrels daily. This represents an increase of 50 percent over the 1947 output of 200,000 barrels, but is still short of prewar rates.

Most attention has been given to rehabilitation of old wells destroyed during denial operations, and a considerable amount of progress was made along these lines. Some attempt was made to reactivate the exploratory program interrupted by the war and a small amount of geological field work was carried on during the early part of the year, but the deterioration in conditions resulted in the outbreak of full-scale civil war during the last half of the year and this work as well as much of the reconstruction of refineries was halted.

It has not been possible to start new drilling, and at the close of the year the outlook was still very uncertain. The Burmah Oil Company was able during the year to complete work on its 1200-barrel refinery in the Chauk area, and the plant processed all of the production reported for the year. Some oil was produced in other fields, but in very small amounts and most of it was through illicit working of wells and pits. Work had been started on other projects, including repairs and reconstruction on the 325-mile pipe line from the Yenangyaung and Chauk fields to Burmah Oil Company's refinery at Syriam, a suburb of Rangoon. The plant, which had a pre-war capacity of 20,000 barrels daily, was totally destroyed, and it was expected that it would be back in operation by late 1949 or early in 1950. However, insurrections have forced stoppage of work on both the pipe line and refinery.

Refineries of Burma

COMPANY	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Type of Refinery	Operating Status
Burmah Oil Co., Ltd.	Chauk	1,200	None	Skim.	Operating
Burmah Oil Co., Ltd.	Syriam (Rangoon)	20,000	2,000	Complete	Destroyed; Rebuilding
Moola Oil Co.	Minbu	450	None	Skim.	Operating
Nath Singh Oil Co., Ltd.	Yenangyaung	200	None	Skim.	Operating

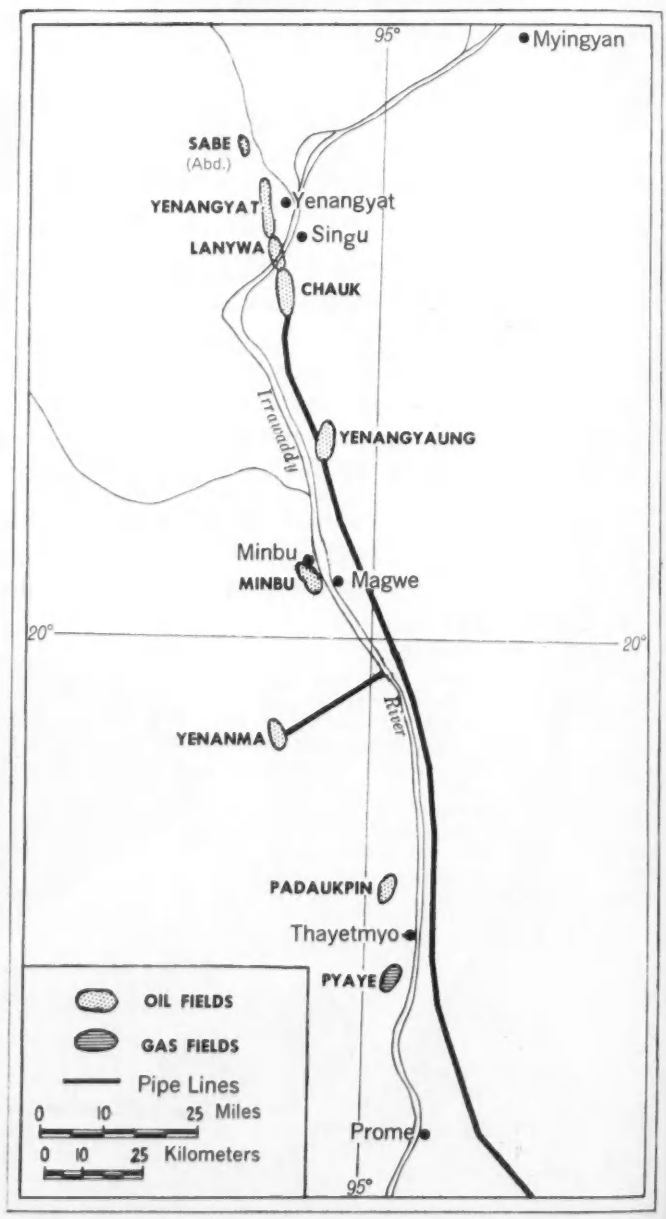
Engineering and Geological Data on Burma Fields

Province and Field	Range of Gravity Oil (A.P.I.)	Producing Formation		DEPTH (Feet)		Type of Structure
		Kind	Age	Minimum to Top of Pay	Maximum to Bottom of Pay	
Magwe						
Chauk (Singu)	39.6	Sand	Oligocene	2000	5000	Asymmetric
Yenangyaung	37	Sand	Miocene-Oligocene	350	5000	Anticline
Minbu Dist.						
Minbu	37.8	Sand	Miocene-Oligocene	....	....	Faulted Asymmetric Anticline
Pakokku						
Lanywa	....	Sand	Oligocene	....	....	
Yenangyat	38.8	Sand	Oligocene	400	4200	Faulted Asymmetric Anticline
Thayetmyo						
Pyaye	Gas	Sand	Miocene	....	....	
Yenanma	....	Sand	Oligocene	600	700	Monocline
U. Chindwin						
Indaw	31.1	Sand	Miocene	....	2000	Anticline

Further uncertainty as to the future of petroleum developments in Burma was given by provisions of the new constitution. Since Burma has been given status as independent state, the constitution shows strong nationalistic tendencies. One of its provisions denies granting of concessions for oil and gas development to foreign companies. It is stated that existing leases will be respected, but that no expansion will be allowed. The Government also proposed a partnership arrangement whereby it would contribute to the cost of rehabilitation of its national petroleum industry, but such negotiations hinged upon the ability of the Government to secure a foreign loan. Meanwhile it became necessaary to evacuate many of the oil company employees and their families from the central Burma fields.

Before the war the Yenangyaung fields produced 8000 barrels daily, and the Chauk fields produced upward of 13,000 barrels a day. Both are multiple-sand fields, the former having between 50 and 60 separate sands, 10 to 15 of which will be present in one well. The Chaulk fields have as many as 35 separate sands and have produced roughly 100 million barrels of oil. Yenangyaung fields have produced 175 million barrels since discovery in 1905.

Irrawaddy River Fields



CHINA

FOLLOWING a decline in production during 1947, China's oil output was improved during the past year due to the ability of the Chinese Petroleum Corporation to drill seven new wells in the Yumen or Laochunmiao field of Kansu Province. Output during 1948 was 549,000 barrels, including 17,000 barrels produced from Formosa (Taiwan) fields. This compares with a production of 377,451 barrels in 1947. The completion of seven wells brings to 41 the total number of wells drilled in the Laochunmiao field, and at the end of the past year 19 of these wells were on production as flowing wells. None of the wells drilled in the area have been dry holes, but some difficulty has been experienced because of the high paraffin content of the oil, and frequent workover and cleanout jobs are required. Consequently, no more than half the wells are on stream during normal operations.

As has been the case ever since discovery of this field, local demand determines the producing rates, since there exists no transportation system for moving the oil or products to larger consuming centers. A refinery in the field area processes the current output which is moved by truck to the populated centers in the vicinity. It has a nominal throughput capacity of 3000 barrels daily.

The field itself produces from sands in the Tertiary, found at depths as shallow as 460 feet, and as deep as 3000 feet, although the majority of the wells have been completed in what is known as the "L" sand which comes in between 1400 and 1650 feet, wells being drilled through the sand to about 1710 feet and completed through perforated casing. This principal sand has an effective thickness averaging 83 feet, and covers the greatest area of any of the productive horizons. Currently the productive area is estimated at 3000 acres.

Geological reconnaissance has resulted in the outlining of a number of prospects, mostly in northwestern China, and some drilling has been done, but so far Laochinmiao is the only commercial field. A little-known fact is the elevation of the field which is located on a high plateau with ground elevations varying from 7800 to 8500 feet.

On Formosa, most of the efforts of the Chinese Petroleum Corporation have been toward rehabilitation of the refinery built during the Japanese occupation at Kaohsiung. Originally it had a capacity of 15,000 barrels daily, used to process crudes brought from the East Indies during the war. At the time it was returned to the Chinese it had been severely damaged and required six months work before it could be operated at a capacity of 7500 barrels daily. Another unit has now been repaired and at the close of the year its throughput potential was 16,000 barrels daily. The reconstruction work also included repairs to port and terminal facilities and building a short pipe line from terminal to refinery.

During the occupation the Japanese drilled a number of wildcat wells and succeeded in developing seven structures along the western side of the mountain range. Four of these were productive at the end of the war, although for the most part they are gas fields, making very small quantities of crude oil. Production during 1948 totaled 17,000 barrels of oil and an estimated 1½ billion cubic feet of gas.

INDIA

ALTHOUGH some exploratory work is under way in India, the Digboi field in northeastern Assam remains as the only producing area in that Dominion. During 1948 it was possible to increase development drilling, particularly in the east end of the field, and a slight increase in production was attained. Total output for 1948 was 1,930,000 barrels, compared to 1,860,000 barrels in 1947. The operations are carried on by Assam Oil Company, an affiliate of the Burmah Oil Company, which holds concessions on the area covered by Digboi field. The field itself is an anticlinal structure with 35.8-gravity oil being produced from an average depth of 5,000 feet.

Burmah Oil Company (India Concessions) Ltd., has expanded its exploratory operations during the year. Some geophysical work is being carried on in Upper Assam, following earlier surface geology, although no new prospects have been reported as a result of the most recent studies. Other prospects, some of which have received attention in the past, are to be drilled during 1949. At the close of the year a rig was being moved in to drill a test in the Tiru Hills, on the south side of the Brahmaputra Valley about 90 miles south of Digboi. Another rig was moved in to a prospect at Masimpur in the Surma Valley of southern Assam, and drilling was also scheduled on a prospect still farther to the southwest in the State of Tripura. During 1948 shallow drilling continued in the Makum-Namdang area about 10 miles south of Digboi, but without success.

The company operates a 6300-barrel refinery in the Digboi field, a plant whose capacity includes 2,000 barrels cracking capacity.

PAKISTAN

DURING 1948 Attock Oil Company produced 560,000 barrels from its Khaur, Dhulian and Joya Mair fields, and following completion of a pipe line from Balkassar field, this area has also gone on production. The crude oil output compares somewhat higher than the 330,082 barrels produced in 1947. Although there were no actual completions during the year, three wells are drilling at Balkassar, one was being operated on the Meyal structure west of Dhulian, and a deep wildcat was being drilled at Lakhra, about 100 miles northeast of Karachi. This latter well is being drilled by Burmah Oil Co. (Pakistan Concessions) Limited, whereas all other operations are by Attock. The Lakhra test had drilled to 4800 feet at the end of the year, where it was drilling in formations of Cretaceous age.

Geological work was being continued in western Pakistan by the Attock Oil Company, and in both eastern and western Pakistan by the Burmah Oil Company. Seismograph geophysical work was carried on throughout the year in the western part of the country, mostly in the Indus Valley, with two reflection crews and one refraction crew working during the early part of 1948. At the end of the year only one geophysical party remained in Pakistan, since results were consistently unfavorable, and Burmah Oil Company has released most of its concessions in the Indus Valley region. The one remaining crew is being used for detail work around the Balkassar field.

Attock Oil Company has a small topping plant in the Dhulian field, and another plant at Rawalpindi. The latter has throughput capacity of 6500 barrels a day, including 2500 barrels cracking capacity.

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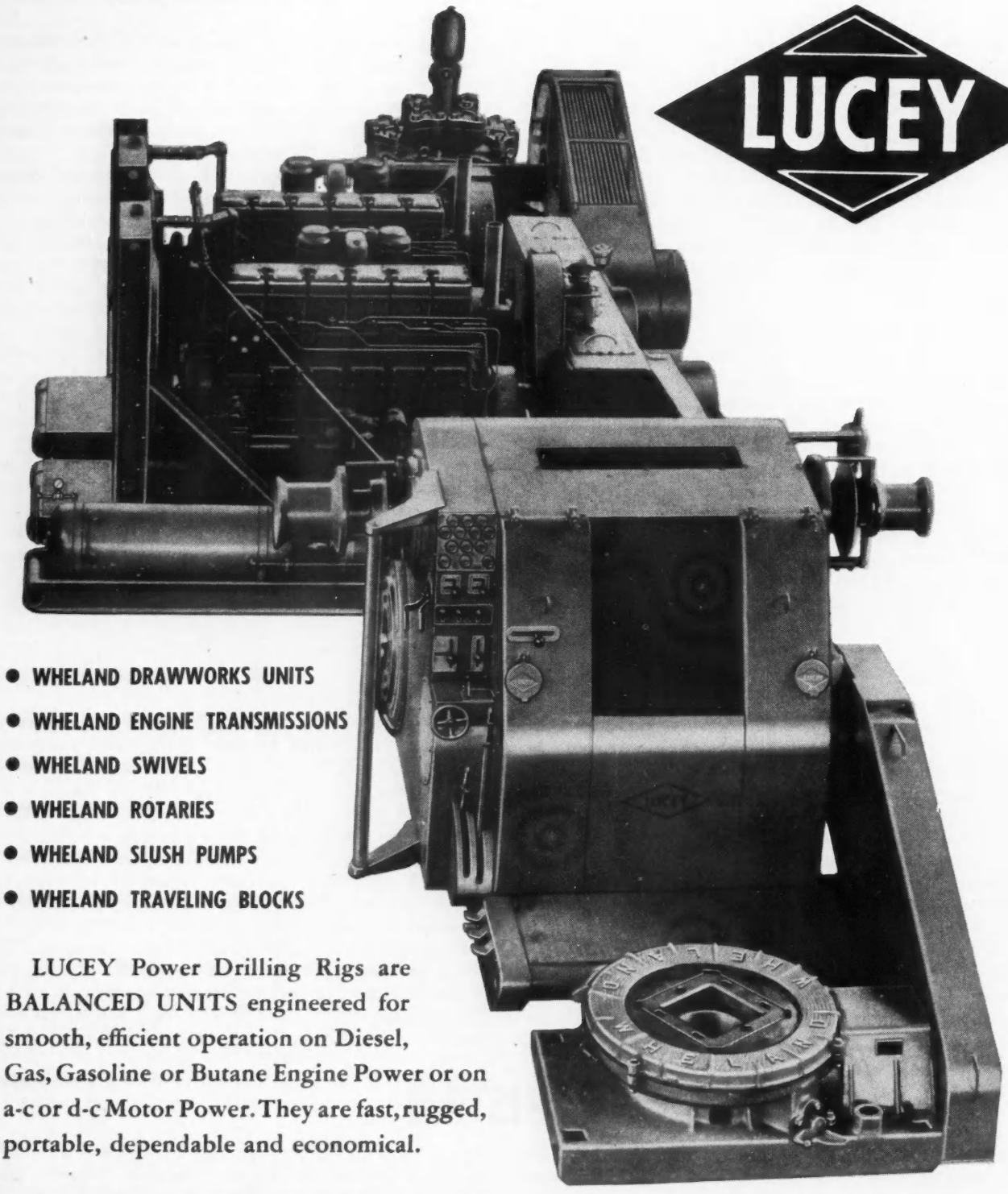

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JAPAN

JAPAN'S crude oil production during 1948 averaged 3070 barrels a day, a drop of 12.3 percent from the 3500 barrels daily average output of 1947, and was the lowest output since 1902. The number of producing wells also decreased from 4058 in March, 1947, to 3712 in March, 1948. The production statistics below are based on the fiscal year, while drilling statistics are available for the calendar year.

Most producing fields are fully drilled up and near depletion, but the results of the coordinated exploration program instituted by the Petroleum Exploration Advancement Com-

Oil Production and Producing Wells in Japan

PREFECTURE AND FIELD	Operating Company	Year of Discovery	PRODUCING OIL WELLS END OF MARCH, 1948			CRUDE OIL PRODUCTION (Barrels)			
			Flowing	Art. Lift	Total	Daily Avge. Dec. 1948	Fiscal Year 1946-1947	Fiscal Year 1947-1948	Cumulative Through March, 1948
Akita:									
Asahikawa	Imperial Oil Co.	1908	....	131	131	47	17,269	18,431	
Asahikawa	Karita Industrial Co.	1908	....	14	14	3	1,032	1,228	4,089,943
Michikawa		1922	....	1	1	2	107	207	
Michikawa	Imperial Oil Co.	1922	....	6	6	76	7,668	19,298	
Asanai		1940	....	17	17	4	912	1,112	5,936
Hachimori	Daido Oil Co.	1938	....	12	12	47	16,285	57,972	173,872
Hanekawa	Imperial Oil Co.	1919	....	24	24	9	2,120	2,959	209,554
Hibiki	Nippon Oilfield Co.	n. a.	....	....	....	....	736	....	83,575
Higashi-Hachimori	Imperial Oil Co.	1941	....	12	12	80	87,123	67,592	270,658
Higashi-Hachimori	Eguchi Oil Assn.	1941	....	5	5	26	32,469	16,176	120,162
Iwako	Daido Oil Co.	1939	....	....	....	....	428	....	9,951
Kamihama	Imperial Oil Co.	1940	....	13	13	35	23,116	16,124	61,833
Katsurane		1919	....	78	78	10	6,240	6,431	583,180
Katsurazaka		1928	2	20	22	85	29,381	28,997	290,623
Katte		1919	....	81	81	18	8,743	8,799	592,083
Kimigano	Ishikawa Co.	n. a.	....	....	....	....	25	....	n. a.
Kurokawa	Imperial Oil Co.	1912	....	95	95	34	19,568	20,576	7,329,021
Matsugasaki		1941	....	....	....	....	....	....	333
Niida		1938	....	4	4	10	3,327	2,880	122,572
Nishi-Hachimorie		1938	....	5	5	15	1,132	775	12,883
Toyoiwa		1902	....	4	4	4	2,566	2,213	25,102
Toyokawa		1912	....	271	271	34	17,650	15,588	
Toyokawa	Daido Oil Co.	1912	....	39	39	4	1,547	1,374	5,045,857
Urayama	Imperial Oil Co.	1912	....	97	97	19	5,975	7,205	
Uchimichika		1921	....	2	2	1	57	107	31,708
Yabase		1934	14	263	277	743	463,988	451,937	9,366,779
Total Akita		....	16	1,194	1,210	1,306	749,455	747,981	28,425,625
Hokkaido:									
Atsuta	Imperial Oil Co.	n. a.	....	8	8	3	868	949	19,794
Fureoi		1905	....	95	95	19	7,661	8,033	297,845
Ishikari		1903	....	73	73	22	9,963	9,933	846,805
Karumai		1906	....	79	79	9	4,170	4,488	378,787
Kinausu	Hokkaido Oil Dev. Co.	1936	....	....	....	....	....	....	126
Koetoi	Imperial Oil Co.	1922	....	7	7	3	1,384	1,481	27,566
Masuporo		1923	....	3	3	....	333	309	39,489
Menashi		1915	....	3	3	1	308	303	12,065
Toyotomi		1930	....	....	....	....	421	276	2,817
Wakkanai		1914	....	....	....	....	94	279	2,235
Yuchi	Hokkaido Oil Dev. Co.	1939	....	5	5	2	944	234	5,096
Tota lHokkaido		....	....	273	273	59	26,146	26,285	1,632,625
Niigata:									
Amaze	Imperial Oil Co.	1873	....	10	10	1	453	321	165,830
Betsuyama		n. a.	....	....	....	....	11,177	....	366,638
Echigo-Kurokawa		1941	....	59	59	19	8,982	8,103	107,649
Echigo-Kurokawa	Daido Oil Co.	1941	....	21	21	10	7,215	4,631	25,199
Echigo-Kurokawa	Hokuriku Oil Assn.	1941	....	43	43	21	9,422	6,657	51,177
Gohtsu	Imperial Oil Co.	1902	2	16	18	20	1,887	1,589	41,052
Higashiyama		1874	....	354	354	196	66,233	65,712	6,857,302
Ishiji		1934	....	11	11	....	704	404	27,986
Izumozaki	Tone Boring Co.	n. a.	....	3	3	....	164	261	1,160
Kaji	Daido Oil Co.	1945	....	2	2	32	3,560	1,807	9,688
Kashiwazaki	Imperial Oil Co.	1936	3	1	4	....	195	293	8,829
Kengamine		1941	....	1	1	1	742	148	2,394
Kuwazone		1945	....	....	....	....	25	....	176
Maki		1900	....	158	158	11	4,717	4,805	909,892
Miyagawa		1895	....	44	44	6	3,956	3,531	1,936,115
Niitsu		1874	3	658	661	229	103,502	112,132	16,483,467
Niitsu	Daido Oil Co.	1874	....	15	15	1	1,346	588	5,595
Niitsu	Hokuriku Oil Assn.	1874	....	100	100	19	7,749	4,401	45,651
Nishiyama	Imperial Oil Co.	1898	3	242	245	113	43,218	46,037	12,481,839
Ohmo		1916	....	62	62	27	11,058	9,332	1,348,844
Shibata		1945	....	6	6	30	16,348	13,537	53,258
Takamachi		1924	....	114	114	23	8,234	8,311	3,222,796
Torigoe		1898	1	70	71	6	2,610	2,533	525,685
Tsukioka	Daido Oil Co.	1941	....	1	1	....	25	7	296
Total Nigata		....	12	1,991	2,003	765	313,522	295,140	44,678,518
Shizuoka:									
Sagara	Imperial Oil Co.	1908	....	7	7	1	38	94	590
Sagara	Saito Oil Co.	1908	....	7	7	....	31	70	535
Total Shizuoka		....	....	14	14	1	69	164	1,125
Yamagata:									
Chokaizan	Imperial Oil Co.	1922	....	21	21	34	10,485	10,065	351,398
Innai		1922	1	96	97	287	89,739	99,054	4,098,179
Ishinazaka		1944	4	13	17	156	100,898	75,172	288,780
Kamioguni		n. a.	....	41	41	60	22,380	19,451	1,098,807
Kotaki		1938	....	36	36	35	8,428	10,136	172,695
Narahashi		1947	....	....	....	73	.....	7,459	7,459
Total Yamagata		....	5	207	212	645	231,930	221,337	6,017,318
Total—All Fields		....	33	3,679	3,712	2,776	1,321,122	1,290,907	80,755,211

n. a.—Not Available.

JAPAN—Continued

mittee has been such that new oil reserves have been equal to a year's production. Since March a new deep pay has been added at Yabase Field, another at Kaji, and a minor new field has been indicated at Nishi-Ishinazaka. There have also been small additions through extensions in other fields. A new gas field was opened in northern Hokkaido when Imperial's Toyotomi R-2 produced 343,000 cubic feet of gas daily from 2835 feet. The structure will be prospected for possible oil in deeper horizons when heavier drilling equipment is available.

Total drilling volume was off slightly from 1947. 53 wells were drilled, of which 26 were oil and 3 were gas producers. The heaviest development was at Yabase and Narahashi where 20 wells were drilled. These are new pays brought in during 1947 and a much more active program planned for 1948 was held back considerably by the labor situation.

Geological and geophysical work during the year have resulted in finding a number of new areas in northern Hokkaido where surface work has shown good prospects for additional Cretaceous production, and in Honshu where several new closures were worked out for future drilling. Geophysical surveys have been somewhat slow, since prewar torsion balance equipment is being used for gravity work, and all seismic equipment is outmoded prewar material in poor condition.

Domestic production still accounts for only about 10 percent of consumption, and all imports are in the form of refined products.

Drilling in Japan in 1948

Prefecture and Fields	Wells Completed in 1947					Wells Completed in 1948				
				Total					Total	
	Oil	Gas	Dry	Wells	Footage	Oil	Gas	Dry	Wells	Footage
Akita:										
Higashi-Hachimori	2	..	..	2	3,775	..	..	1	1	1,380
Kameda	..	..	..	..	.....	1	..	..	1	756
Kamihama	1	..	1	2	2,040	1	..	1	2	3,296
Katsurazaka	1	..	..	1	1,958	..	..	1	1	3,120
Konoura	..	..	..	..	.....	..	..	..	..	.....
Nishi-Hachimori	2	..	..	2	4,580	1	1	1	3	5,937
Sawame	..	..	..	..	.....	1	..	2	3	5,380
Toyoiwa	..	..	1	1	3,240	..	..	..	..	.....
Yabase	8	..	4	12	34,050	7	..	5	12	30,003
Wildcats	..	..	1	1	1,365	..	..	..	..	.....
Hokkaido:										
Fureoi	..	..	1	1	920	..	..	..	..	.....
Koetoi	..	..	1	1	3,304	..	..	..	..	.....
Wildcats	..	..	..	..	.....	..	1	..	1	2,835
Niigata:										
Betsuyama	2	..	..	2	11,190	1	..	..	1	5,290
Garameki	..	..	1	1	1,970	..	..	..	..	.....
Gohtsu	..	..	1	1	3,940	..	..	..	..	.....
Haguro	2	1	1	4	3,820	4	..	1	5	4,380
Kaji	..	..	..	..	.....	2	..	..	2	5,155
Kurokawa	1	..	3	4	5,280	4	..	1	5	5,737
Nakajo	..	..	..	..	.....	..	..	1	1	1,640
Niigata	..	3	..	3	4,750	..	..	..	..	.....
Niitsu	..	..	1	1	4,475	..	..	..	..	.....
Sekiya	..	1	..	1	1,681	..	..	..	..	.....
Shibata	2	..	1	3	6,560	..	1	1	2	5,830
Shimohama	..	..	1	1	1,310	..	..	..	..	.....
Taya	..	..	1	1	4,090	..	..	..	..	.....
Tomine	..	..	1	1	1,970	..	..	..	..	.....
Wildcats	..	..	5	5	13,201	..	..	3	3	8,360
Yamagata:										
Narahashi	..	..	..	..	.....	3	..	5	8	9,192
Nishi-Ishinazaka	..	..	1	1	676	..	..	1	1	980
Wildcats	2	..	5	7	13,885	1	..	..	1	739
Totals	23	5	31	59	134,030	26	3	24	53	100,010

Wildcats Completed in Japan in 1948

Prefecture	Company	Well Name	Date Completed	Depth (Feet)	Results
Hokkaido	Imperial Oil Co.	Toyotomi R-2	June 20	2835	Gas: 343 mcf
Niigata	Imperial Oil Co.	Iwata R-1	June 27	5900	Abandoned
	Taihei Oil Co.	Kuzuryu C-1	March 22	820	Abandoned
	Nagai Oil Co.	Miyahisa C-2	Feb. 25	1640	Abandoned
Yamagata	Imperial Oil Co.	Nishi-Ishinazaka R-6	March 23	739	Oil: 13 bbls.
Total	.....	5 wells			

Refineries of Japan

COMPANY	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Type of Refinery	Operating Status
Nippon Oil Co.	**Akita**				
	Akita	4000	None	Skim & Asphalt	Operating
Nippon Mining Co.	Funakawa	2000	None	Skim	Operating
Showa Oil Co.	Hirasawa	2000	None	Lube, asphalt	Operating
Maruzen Oil Co.	**Ehime**				
	Matsuyama	2000	None	Lube	Shut Down
Nippon Oil Co.	**Hokkaido**				
	Garugawa	250	None	Skimming	Operating
Showa Oil Co.	**Kanagawa**				
	Kawasaki	3000	None	Skimming, lube	Shut Down
Mitsubishi Oil Co.	Kawasaki	4000	None	n. a.	Shut Down
Kos Oil Co.	Yokahama	500	None	Lube	Shut Down
Nippon Oil Co.	Yokahama	7000	1000	Skim-Crk-lube	Shut Down
Maruzen Oil Co.	**Matsuyama**				
	Matsuyama	2000	None	Lube	Shut Down
Daikyo Oil Co.	**Mie**				
	Yokkaichi	1200	None	Lube	Shut Down
Maruzen Oil Co.	**Nagasaki**				
	Imafuku	110	None	Lube	Shut Down
Nippon Oil Co.	**Niigata**				
	Kashiwazaki	2000	None	Skimming, wax	Operating
	Niigata	1500	None	Lube, asphalt	Operating
Showa Oil Co.	Niigata	1000	950	Skim-Crk-lube-asphalt	Operating
Toa Fuel Co.	**Shizuoka**				
	Shimizu	2500	None	Lube	Shut Down
Showa Oil Co.	**Wakayama**				
	Kainan	400	None	Lube	Shut Down
Toa Fuel Co.	Wakayama	10000	n. a.	n. a.	Shut Down
Maruzen Oil Co.	Shimotsu	2000	None	Lube	Shut Down
Nippon Oil Co.	**Yamaguchi**				
	Kudamatsu	7000	None	Skimming	Shut Down

PHILIPPINE ISLANDS

OPERATIONS in the Philippines are limited to the activities of one company at the present time, but it is hoped that passage of a new petroleum law would do much to stimulate interest of outside operators.

The Philippine Oil Development Company (formerly Far East Development Company) is carrying on exploration work on its leases acquired before World War II, and has maintained one rig in the islands for several years. Late in 1947 a test in the Daanbantayan area of northern Cebu reached the basement complex at 9950 feet and was abandoned after having established a deep drilling record for the Philippines.

Meanwhile the rig used for the Daanbantayan test has been moved to the Bondoc Peninsula and attempts are being made to drill a deep test. The first well started drilling in July of 1948 but had mechanical trouble after reaching 1372 feet. The rig was moved 1000 feet to the west and another hole started which also had trouble, although it was carried to 2360 feet and reported definite showings of oil and gas. The hole was junked without testing and the rig has been moved about 600 feet northward where a new test was spudded early in 1949.

As early as the days of the Spanish occupation of the islands shallow wells had been dug in the Toledo area, Cebu, from which a few gallons of heavy oil a day were obtained, but there have been few large-scale attempts to establish commercial production. A number of wells were drilled on Bondoc peninsula by Richmond Petroleum Company starting in 1922, but no commercial wells were completed.

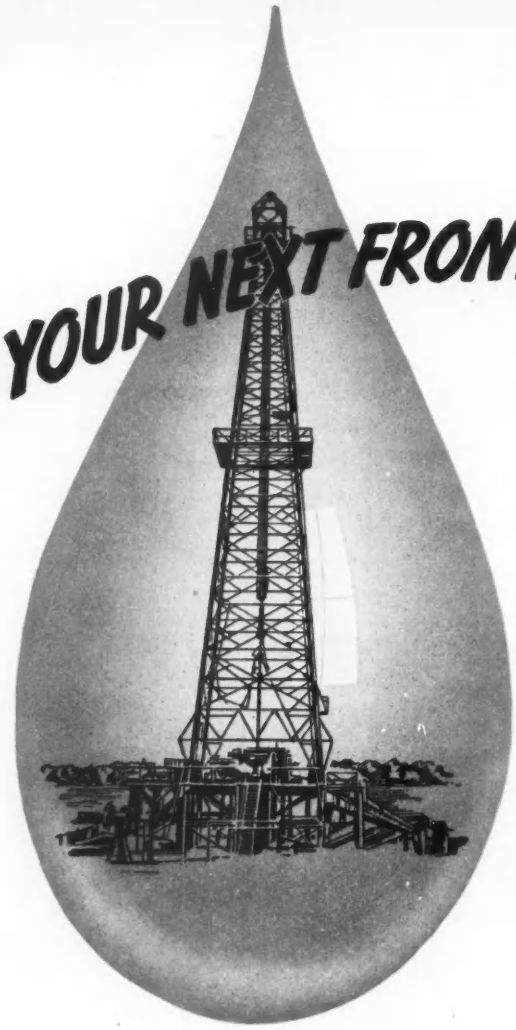
Since 1939 the granting of leases has been suspended by the Government, acting under its so-called Petroleum Act, pending the possible formulation of a new oil policy, including oil laws.

The Government sent an oil mission to Europe, the United States and Mexico during 1948 to study trends in oil legislation, and a draft of a new law has been prepared; approved by the Philippine Oil Commission and has now been submitted for legislative action.

BORNEO-BRUNEI-SARAWAK

TARAKAN FIELDS
Scale
Miles
Kilometers
BORNEO
Tarakan
CELEBES SEA
BALIKPAPAN FIELDS
LEGEND
OIL FIELDS
Pipe Lines
Refineries
BORNEO
EQUATOR
STRAIT OF MAKASSAR
SAMBODJA
Balikpapan
Samarinda
Tandjoeng
TANDJOENG
Bandjermasin
Laoet
Tandjoeng Batoe
Talok
Sandakan
NORTH BORNEO
Sipitang
Tawitawi
PHILIPPINE ISLANDS
SULU SEA
SARAWAK
BRUNEI
Miri
SERIA
Kuching
Sanggau
Pontianak
Ketapang
Maja
KARIMATA STRAIT
Billiton
Banjka
SUMATRA
Tandjoeng Priok
Batavia
Bandjoeng
Semarang
Jogjakarta
Soerabaja
MADOERA
BALI
JAVA SEA
INDIAN OCEAN
CHINA SEA
SOUTH CHINA SEA
CELEBES SEA
Labuan
Brunei
Limbang River
Baram River
Kapuas
Mahakam
Barito
Pasir
Pamaloean
Tandjoeng Redeb
Tandjoeng Batoe
Amoentai
Loksado
Boentok
Soengaitiram
Moeara Kaman
Moeara Moentai
Tenggarong
SANGA SANGA
PELARANG
ANGGANA
SEMBERAH
O.K. MOEMOES
Soengaitiram
Sambodja
Pamaloean
Balikpapan
Badjoe
Pasir
Tandjoeng
Dajoe
Telake River
Mahakam River
Kedang Pahoe River
Lake Djempang
Boelongan
Tandjoeng Redeb
Tandjoeng Batoe
Amoentai
Loksado
Boentok
Soengaitiram
Balikpapan
Bandjermasin
Laoet
Kintap
Kuching
Sanggau
Pontianak
Ketapang
Maja
Billiton
Banjka
Tandjoeng Priok
Batavia
Bandjoeng
Semarang
Jogjakarta
Soerabaja
Melang
Tabalobtoeng
Tandjoeng Batoe
Talok
Sandakan
Tawitawi
Sipitang
Labuan
Brunei
Limbang River
Baram River
Miri
Lutong

TAKE A LOOK NOW AT YOUR NEXT FRONTIER



Deeper exploration — like deeper drilling — requires more than average care and skill.

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EAST INDIES

DESPITE the fact that more than half of its fields are still inaccessible, East Indies progress during 1948 has been such that by the end of the year the pre-war production rate had already been exceeded. Indonesia and British Borneo (Sarawak and Brunei) were producing 165,567 barrels daily at the close of 1948, compared with 110,343 barrels daily at the end of 1947.

These advances were made under difficult conditions. An enormous amount of rehabilitation and reconstruction was necessary while the political situation was still unsettled. Thus far only Southern Sumatra and Borneo have been free of actual hostilities, and the operations in the former have been hampered to some extent during the year.

A large part of the increase during the year was in the Palembang district in Southern Sumatra where the Standard-Vacuum Petroleum Mij. increased its production from about 20,000 barrels daily at the close of 1947 to more than 51,300 barrels daily at the end of 1948. The Bataafsche Petroleum Mij., Shell Group's operating company, also accounted for

Refineries of the East Indies

COMPANY	Location of Plant	Crude Charging Capacity (Bbls. Daily)	Cracking Capacity (Bbls. Daily)	Daily Crude Runs End of 1948 (Bbls.)	Type of Refinery	Operating Status
Borneo:						
N.V. de Bataafsche Pet. Mij.	Balikpapan	8,500	.....	8,500	Skimming	Operating
Java:						
N.V. de Bataafsche Pet. Mij.	Tjepoe	.....	.....	.....	.....	Inaccessible
	Wonokromo	1,500	.....	1,500	Skimming-Asphalt	Operating
N. V. Standard-Vacuum Pet. Mij.	Kapoehn	500	None	n. a.	Skimming	Not operating
Sarawak:						
Sarawak Oilfields, Ltd.	Lutong	35,000	.....	35,000	Skimming	Operating
Sumatra:						
N. V. de Bataafsche Pet Mij.	Pladjoe	50,000	7,700	50,000	Skim.-Crk.	Operating
N. V. Standard-Vacuum Pet. Mij.	P. Brandan	.....	.....	.....	.....	Inaccessible
	Palembang	55,000	23,000	55,000	Skimming, Cracking	Operating

Oil Production and Producing Wells in East Indies Fields

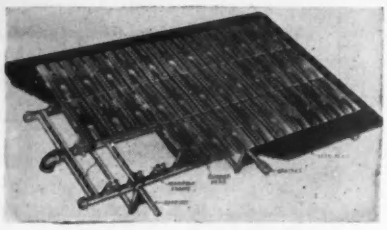
Country, Region and Field	Operating Company	Year of Discovery	PRODUCING OIL WELLS END OF 1948			CRUDE OIL PRODUCTION—(Barrels)			
			Flowing	Art. Lift	Total Producing	Daily at End of 1948	Year 1947	Year 1948	Cumulative Through 1948
Borneo:									
Anggana-Moeara	N. V. de Bataafsche Pet. Mij. (Shell)	1902	1	59	60	4,250	860,000	1,480,000	60,425,000
Sambodja		1910	1	25	26	1,200	84,000	329,000	53,083,000
Sanga Sanga		1897	.....	62	62	3,570	1,017,000	1,299,000	143,335,000
Tandjoeng		1938	1	.....	1	225	72,000	77,000	349,000
Tarakan		1906	4	399	403	7,800	1,841,000	2,670,000	158,454,000
Brunei:									
Seria	British Malayan Pet. Co., Ltd.	1929	57	88	145	61,000	12,991,000	18,246,000	82,295,000
Ceram:									
Boela-Lemoen	N. V. de Bataafsche Pet. Mij.	1897	.....	.....	.....	.....	.....	.....	8,203,000
Java:									
Kawengan	N. V. de Bataafsche Pet. Mij.	1926	.....	.....	.....	.....	.....	.....	38,972,000
Kroeka		1929	.....	48	48	1,490	326,000	475,000	6,865,000
Ledok		1896	.....	.....	.....	.....	.....	.....	21,125,000
Loesi	N. V. Standard-Vacuum Pet. Mij.	1932	.....	.....	.....	.....	.....	.....	505,000
Ngliron		1940	.....	.....	.....	.....	.....	.....	10,000
Nglobo-Semanggi Banjoeasin	N. V. de Bataafsche Pet. Mij.	1897	.....	.....	.....	.....	.....	.....	18,044,000
Petak	N. V. Standard-Vacuum Pet. Mij.	1914	.....	.....	.....	.....	.....	.....	781,000
Soerabaja	N. V. de Bataafsche Pet. Mij.	1896	.....	.....	.....	.....	.....	.....	33,369,000
Tremboel	N. V. Standard-Vacuum Pet. Mij.	1917	.....	.....	.....	.....	.....	.....	355,000
Netherlands New Guinea:									
Klamono	Nederlandsche Nieuw Guinee Pet. Mij.	1936	2	4	6	3,900	1,146	137,000	145,000
Mogoi	(Shell, Standard-Vacuum, & Cal-Tex.)	1940	.....	.....	.....	.....	.....	.....	459
Wasian		1940	.....	.....	.....	.....	.....	.....	862
Sarawak:									
Miri	Sarawak Oilfields, Ltd.	1911	2	107	109	1,090	180,000	342,000	70,811,000
Sumatra (Northern):									
Dj Rajeu	N. V. de Bataafsche Pet. Mij.	1929	.....	.....	.....	.....	.....	.....	559,000
Gebang		1936	.....	.....	.....	.....	.....	.....	135,000
Pangkalan Soesoe		1917	.....	.....	.....	.....	.....	.....	6,287,000
Pase	N. V. Standard-Vacuum Pet. Mij.	1937	.....	.....	.....	.....	.....	.....	52,000
Perlak	N. V. de Bataafsche Pet. Mij.	1900	.....	.....	.....	.....	.....	.....	47,870,000
Poelo Pandjang		1928	.....	.....	.....	.....	.....	.....	11,243,000
Rantau		1929	.....	.....	.....	.....	.....	.....	55,513,000
Serangdjaja		1926	.....	.....	.....	.....	.....	.....	7,551,000
P. Taboehan		1937	.....	.....	.....	.....	.....	.....	3,283,000
Telaga Said, Darat, K. Gadjah		1893	.....	.....	.....	.....	Abandoned	.....	23,621,000
Sumatra (Central):									
Lirik	N. V. Standard-Vacuum Pet. Mij.	1941	.....	.....	.....	.....	Abandoned	.....	242,000
Oekoei		1941	.....	.....	.....	.....	.....	.....	1,000
Sumatra (Southern):									
Babat	N. V. de Bataafsche Pet. Mij.	1901	.....	.....	.....	.....	Abandoned	.....	8,136,000
Badjoebang		1927	.....	.....	.....	.....	Abandoned	.....	24,794,000
Benakat	N. V. Standard-Vacuum Pet. Mij.	1933	86	.....	86	8,137	124,000	2,577,650	39,847,650
Betoeng	N. V. de Bataafsche Pet. Mij.	1913	.....	.....	.....	.....	.....	.....	2,100,000
Djirak	N. V. Standard-Vacuum Pet. Mij.	1930	64	.....	64	4,980	11,000	1,294,858	23,064,858
Karang Ringin	N. V. de Bataafsche Pet. Mij.	1903	.....	.....	.....	.....	Abandoned	.....	1,572,000
Kenali Asam		1931	.....	.....	.....	.....	.....	.....	19,204,000
Kloeang		1914	.....	.....	.....	.....	.....	.....	27,882,000
Kruh	N. V. Standard-Vacuum Pet. Mij.	1948	2	.....	2	182	.....	51,705	51,705
Limau	N. V. de Bataafsche Pet. Mij.	1928	2	1	3	950	80,000	372,000	5,904,000
Mangoendjaja		1935	.....	.....	.....	.....	.....	.....	9,866,000
Moeara Senami		1938	.....	.....	.....	.....	.....	.....	93,000
Moeara Enim (Batoe Kras)		1903	.....	.....	.....	.....	.....	.....	28,172,000
Radja	N. V. Standard-Vacuum Pet. Mij.	1941	2	.....	2	1,244	.....	164,331	164,331
Selo		1938	.....	.....	.....	.....	.....	.....	47,000
Soeban Boeroeng	N. V. de Bataafsche Pet. Mij.	1936	.....	.....	.....	.....	Abandoned	.....	6,800,000
Soeban Djerigi		1905	.....	25	25	790	73,000	292,000	33,698,000
Talang Akar-Pendopo	N. V. Standard-Vacuum Pet. Mij.	1922	253	.....	253	36,784	1,155,000	11,637,104	129,815,104
Talang Djimar	N. V. de Bataafsche Pet. Mij.	1937	68	.....	68	26,100	2,402,000	8,991,000	34,192,000
Tandjoeng Loentar		1912	.....	.....	.....	.....	.....	.....	4,079,000
Tandjoeng Tiga		1940	5	.....	5	1,875	.....	58,000	58,000
Tempino		1931	.....	.....	.....	.....	.....	.....	36,067,000
Total		.....	550	818	1,368	165,567	21,217,146	50,493,648	1,289,091,969

HENRY H. PARIS DISTRIBUTOR Inc.

Manufacturer's Agent - Oil Well and Refinery Supplies

P. O. BOX 932 — 1125 ROTHWELL ST.

HOUSTON, TEXAS



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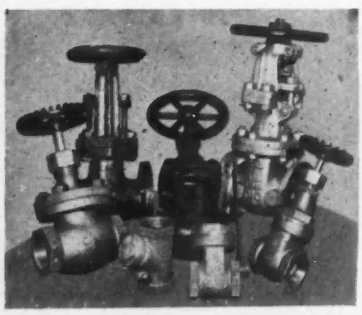

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OIC Valves give you all these benefits: Longer uninterrupted service; Lower maintenance replacement costs; Minimum over-all cost. They've been doing it for users everywhere, as impressive performance records attest. OIC valves are backed by more than 57 years of engineering skill, manufacturing integrity and outstanding valve performance. In OIC's you get all the benefits that it is possible for valves to render.

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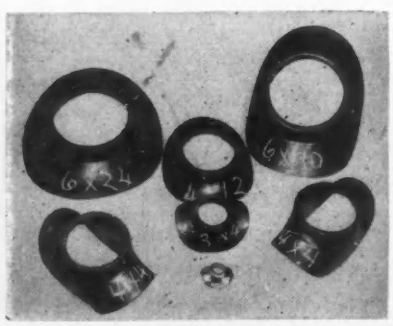

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Fleetline saddles fit the contour of the pipe... have correct wall thickness. They weld neatly into place with much less time and welding rod. Fleetline Saddles are made from welding grade, seamless steel of proper chemical and physical analyses. They do a better, safer, more permanent job at less cost.

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W. C. Norris swaged nipples, bull plugs, stuffing boxes, sucker rods, polished rods, welding caps and other equipment are backed by 63 years manufacturing experience, assuring the user highest quality for the utmost in efficient performance and service at no increase in cost.

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Harrisburg Drop-Forged Steel Pipe Flanges meet every test of strength and safety. Their unvarying uniformity merits your consideration wherever quality is essential. Made to ASA standards.

Harrisburg Forged Seamless Steel Pipe Couplings are uniform in strength and quality. Threads will not strip under most severe strain. Manufactured to API specifications.

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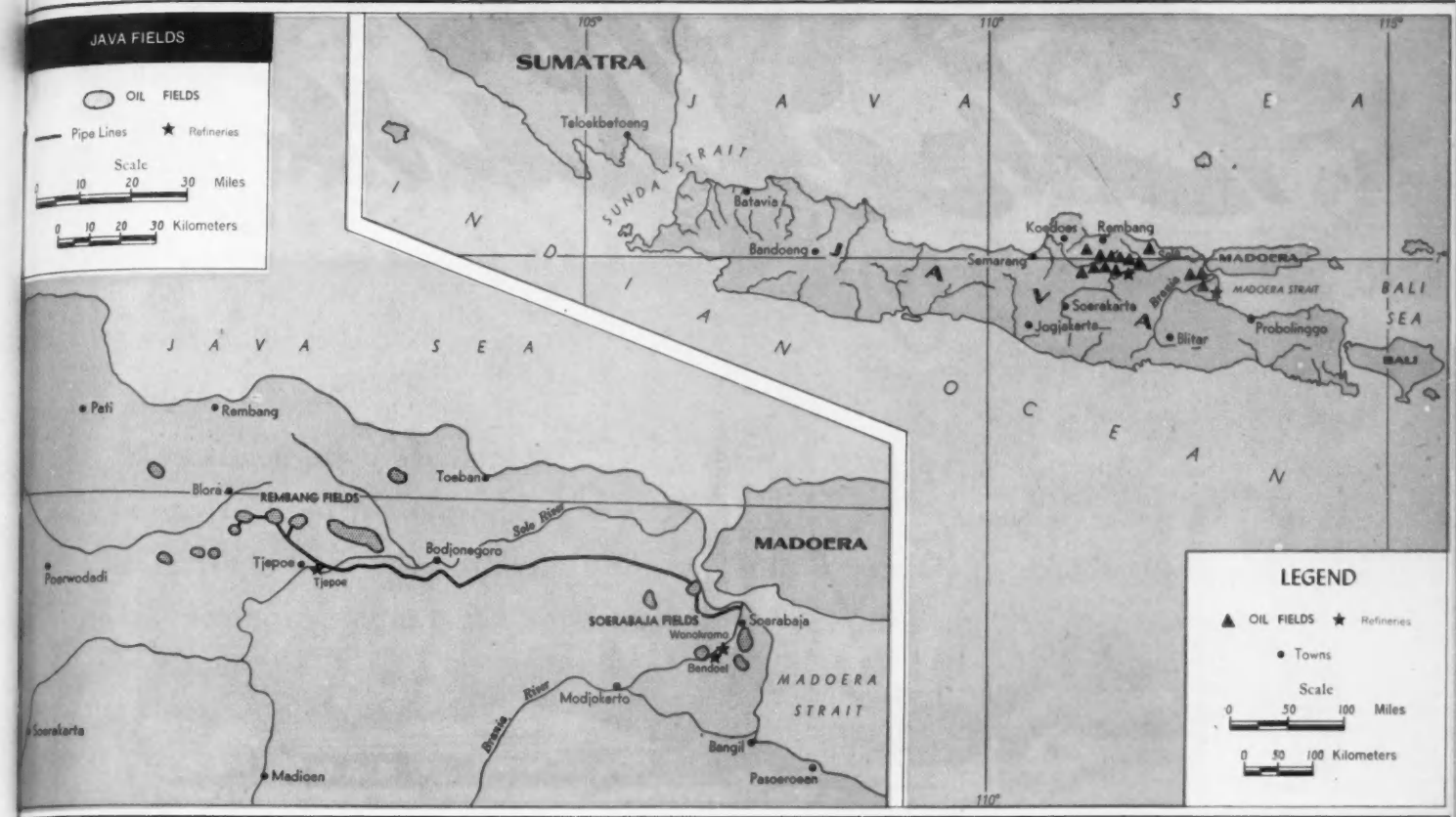
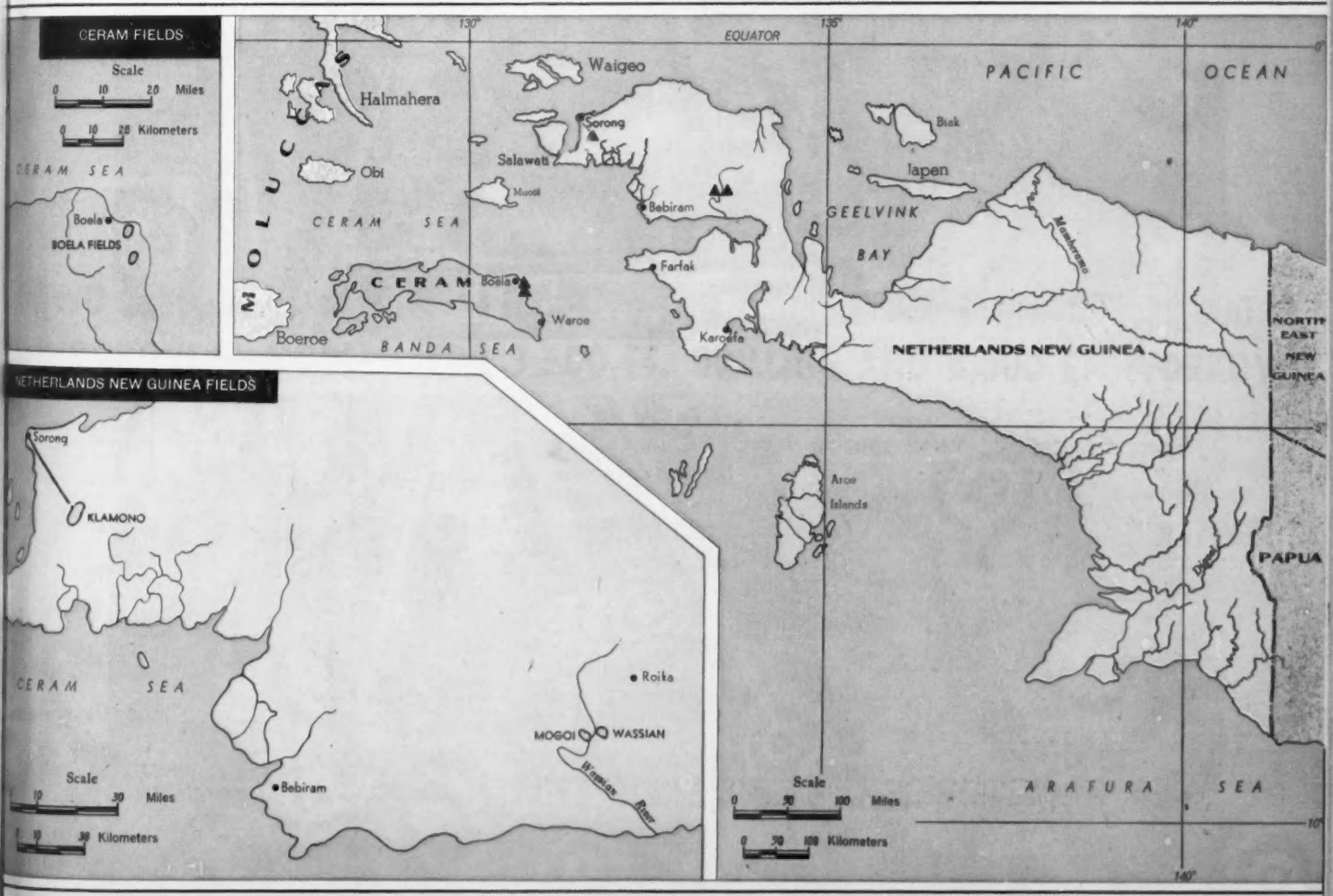
JAVA-CERAM-NETHERLANDS NEW GUINEA





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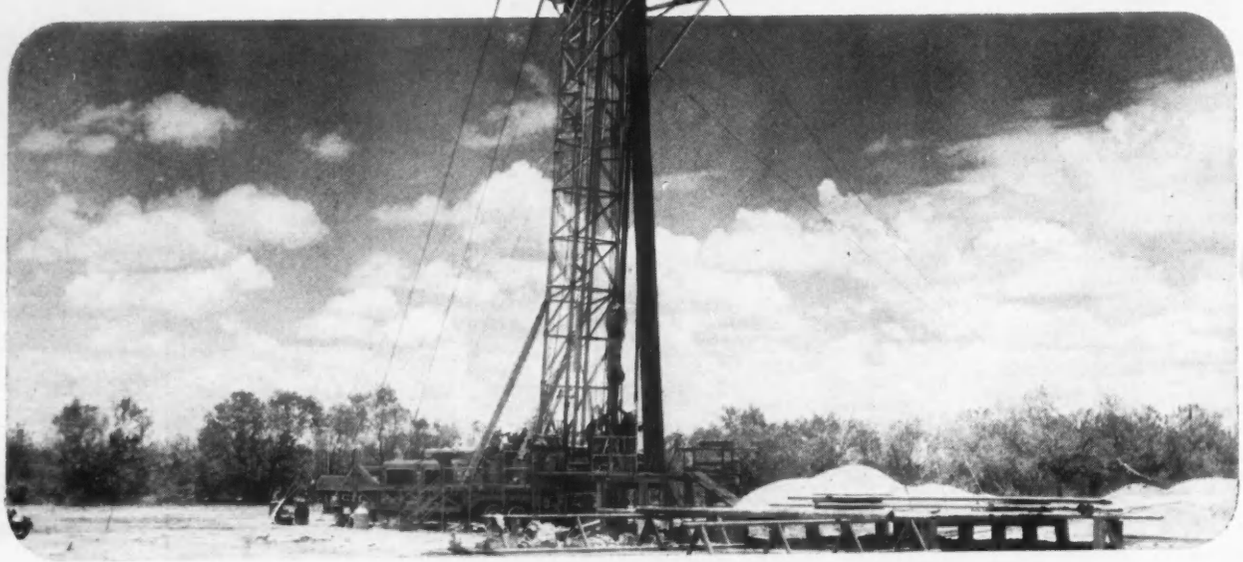

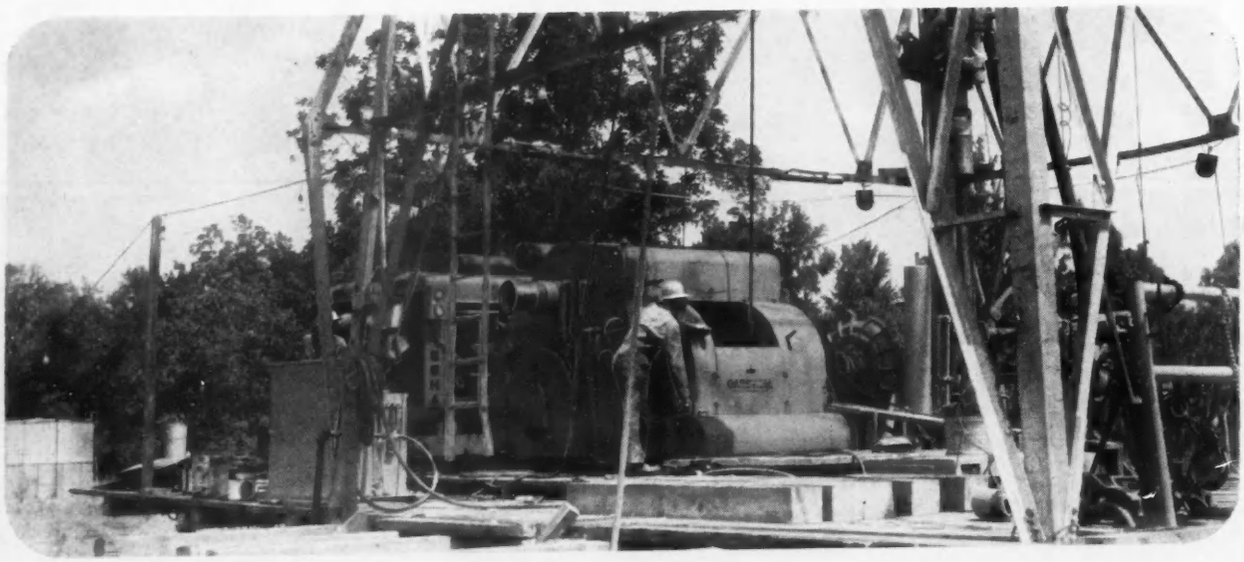

and Workover

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The most modern and completely portable of all rigs. Transported with engines, block, hook and lines in place—ready for operation in a few minutes. Ninety-foot mast is raised by hydraulic rams. Draw works has "Cardwell" Air Disc friction clutches in both ends of main drum, making it possible to double the line speed by moving a single lever. Sand line drum has "Cardwell" Air Disc friction clutch.

DOUBLE-ENGINE MODEL O FOR 8,000-FT. DRILLING AND 15,000-FT. WORKOVER

This sturdy deep-well rig can be transported on one truck without removing engines. Dual drives to main drum provide six forward speeds to draw works. Special three-speed chain transmission has high torque capacity. Model O is available with "Cardwell" Air Disc clutches throughout, or with manually controlled Twin Disc clutches. Sand line drum is optional with both models.

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Low-cost moves, quick rig up and fast operation make these draw works real profit-makers. "Cardwell" Air Disc clutches in "Hi-Lo" drive make it possible to double the line speed instantly. Model S and Model L are available with either gear transmission or torque converter. Finger-tip air controls operate "Hi-Lo" drive, rotary drive, automatic cathead and rotary brake. Draw works can be transported on one truck with largest engine in place.

"Cardwell" Leads the Industry in Design and Manufacture of Portable Drilling Equipment.

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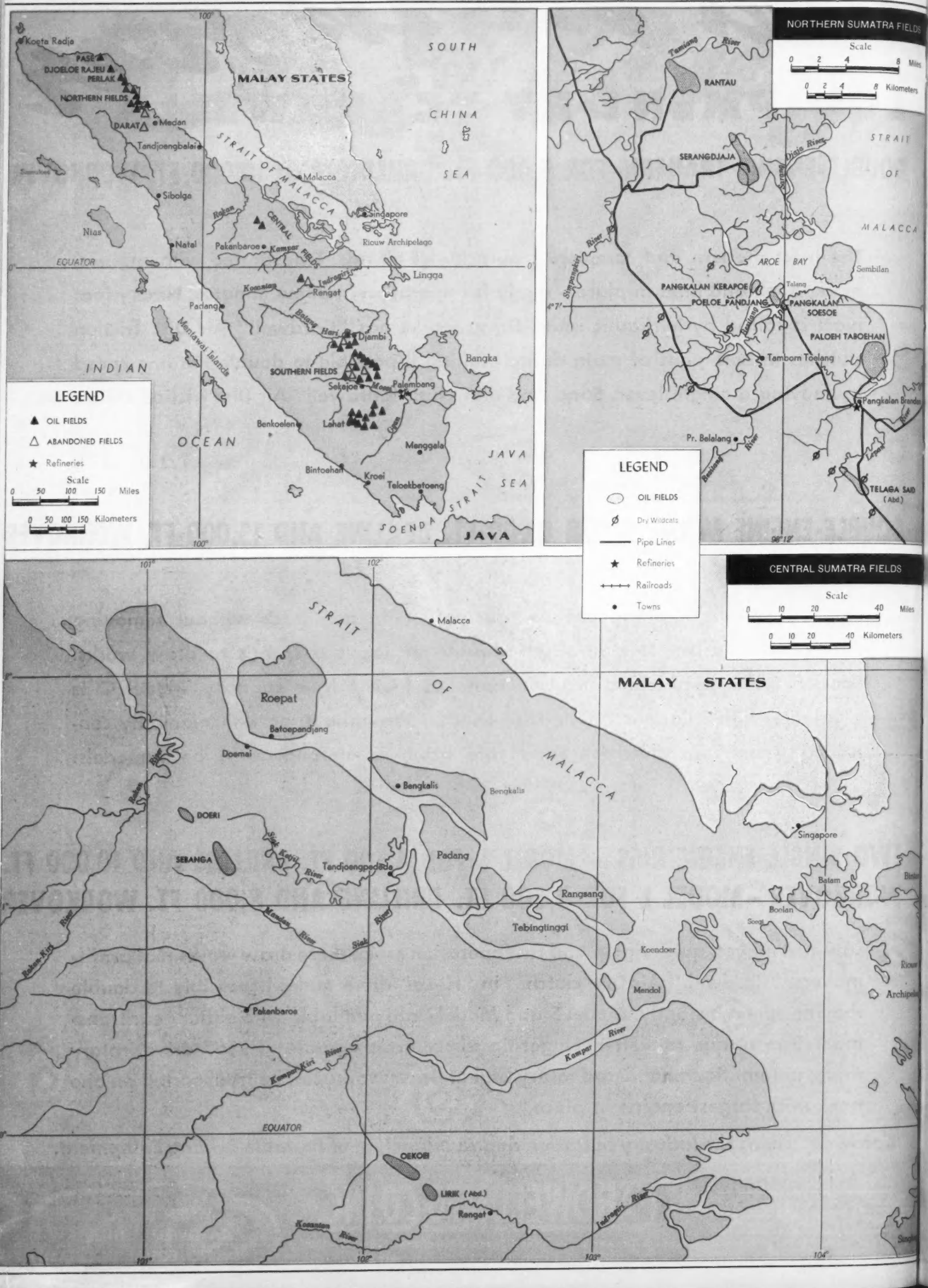
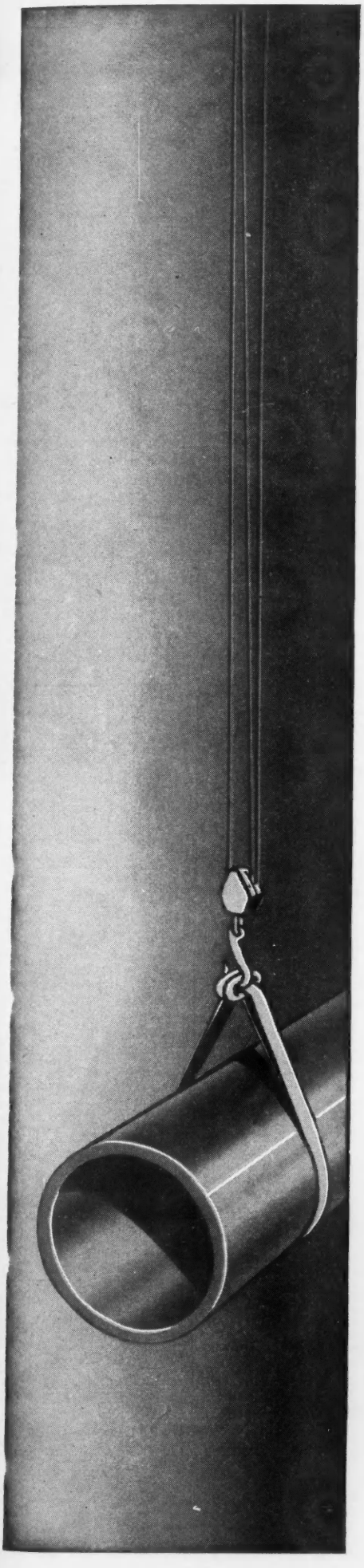
SUMATRA—Northern and Central Oil Areas





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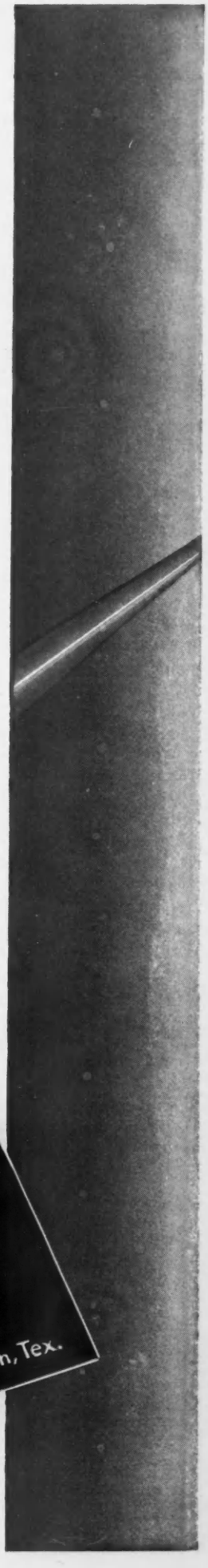

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EAST INDIES—Continued

substantial increases in this area and in Netherlands Borneo where production of 17,045 barrels daily at the end of 1948 compared 4000 barrels higher than at the beginning of the year.

One of the outstanding areas is the Seria field of Brunei, where 15 oil wells were drilled and production was boosted from 49,500 barrels a day at the beginning to 61,000 barrels a day at the end of 1948, nearly three times the prewar producing rate. Plans are now under way for offshore drilling.

During the year several new areas have gone on production. The Radja and Tandjoeng Tiga fields discovered before the war by Standard-Vacuum and by Shell respectively were produced for the first time and a new field was opened at Kruh by Standard-Vacuum.

Another outstanding development of 1948 was opening of Klamono field as the first production from New Guinea. The Nederlandsche Nieww Guinee Pet. Mij. completed its 30-mile road and pipe line in December, and at the end of the year the field was producing 3900 barrels a day.

Drilling activity also saw a sharp rise with 121 wells completed compared to only 68 wells last year. A still greater increase was noted in footage drilled, which totaled 476,571 feet in 1948 compared with 166,981 feet in 1947.

In the Talang Akar-Pendopo area, Standard-Vacuum drilled 51 wells during the year, 49 of which were oil producers, and is operating 14 drilling rigs. The Shell Group drilled 14 oil wells and one gas producer in the Talang Djimar area where three rigs are kept busy, and is operating two rigs at the newly opened Tangjoeng Tiga field. In all 40 rigs are being maintained in the East Indies, and more are expected during 1949 when the Nederlandsche Pacific Petroleum Maatschappij (Standard of California and The Texas Company) plan to reopen activity in Central Sumatra where oil was found on several structures before the war.

Papua

The Australasian Petroleum Company has substantially increased its activities in Papua during the year. Following abandonment of the deep Kariava test in late 1947, three new locations were made and new rigs moved in. Preparations went forward during the year, and Oroi 1, the first of the new series of tests spudded before the end of 1948. Early in 1949 the second, at Upoia, had spudded, the rig was being set up at Hororo 1. Meanwhile locations have been made for two new wildcats near Port Romilly which will be drilled next. The three first named wells are along the Vialala River northwest of Port Moresby.

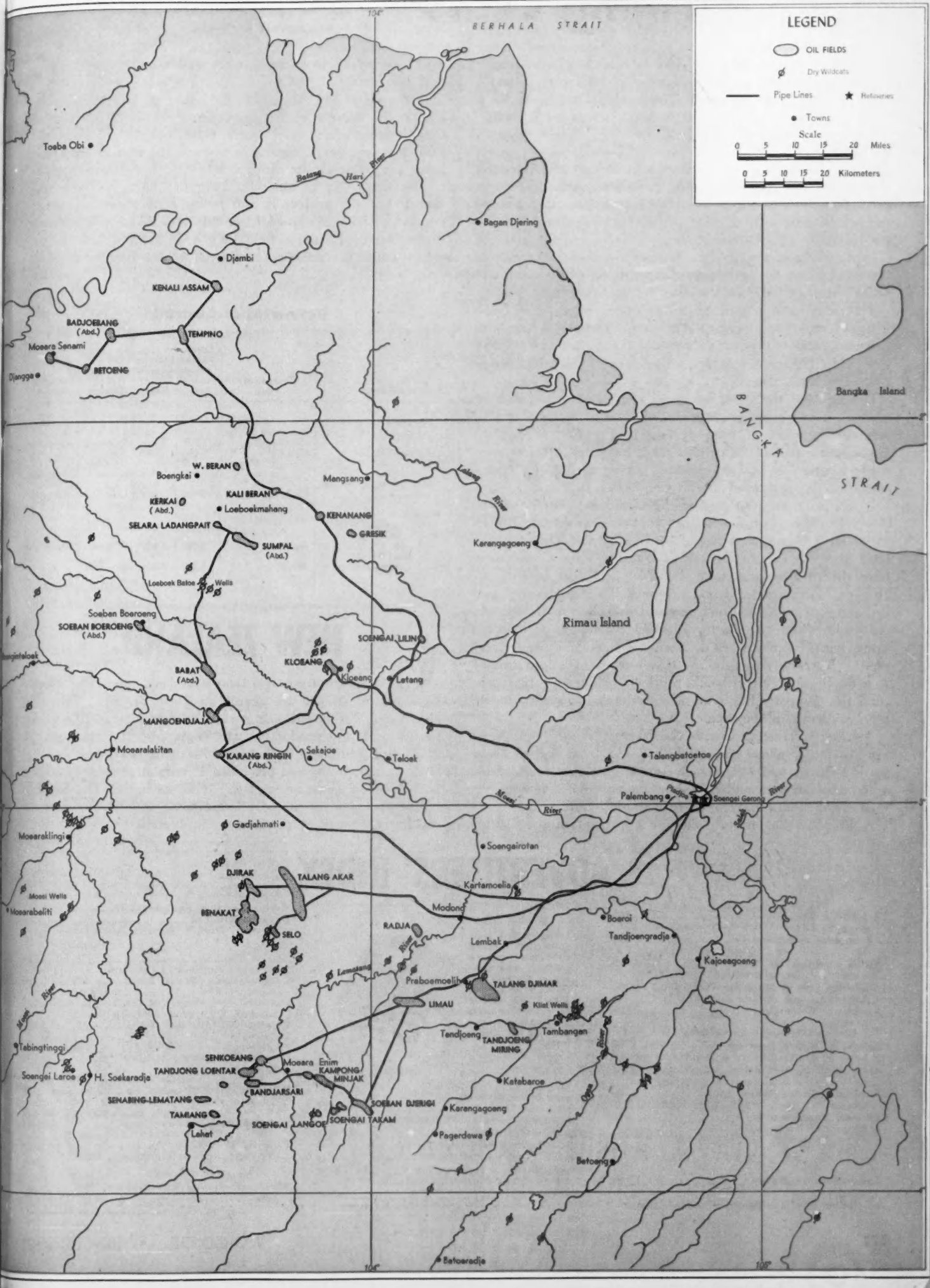
Drilling in East Indies Fields

Country and Field	Wells Completed in 1947					Wells Completed in 1948					Wells Drilling and Shut Down End of 1948		
				Total					Total				
	Oil	Gas	Dry	Wells	Footage	Oil	Gas	Dry	Wells	Footage	Drlg.	SD	Total
Borneo:													
Anggana-Moeara	..	..	..	..	.....	1	..	..	1	1,627	..	..	..
Sanga Sanga	..	..	..	..	.....	3	..	..	3	4,956	..	..	..
Tandjoeng	..	..	..	..	.....	5	..	..	5	26,104	2	..	2
Tarakan	37	..	..	37	41,547	5	..	6	11	20,555	1	..	1
Brunei:													
Seria	21	..	..	21	83,572	15	..	..	15	86,609	3	2	5
Java:													
Kroeka	..	2	1	3	677	..	..	2	2	4,358	..	..	..
Netherlands New Guinea:													
Klamono	..	..	..	..	.....	..	..	..	..	.....	1	..	1
N. Klamono	..	..	..	..	.....	..	..	2	2	3,892	..	1	1
Wildcats	..	..	..	..	.....	..	..	..	..	.....	1	1	2
Sarawak:													
Miri	1	..	..	1	8,227	2	1	..	3	11,947	1	2	3
Sumatra:													
Djirak	..	..	..	..	.....	1	..	1	2	6,795	..	..	..
Kruh	..	..	..	..	.....	2	..	..	2	13,409	2	..	2
Limau	..	..	..	..	.....	..	..	1	1	10,480	1	..	1
Pajakaboeng	..	..	..	..	.....	..	..	1	1	2,516	..	..	..
Radja	..	..	..	..	.....	2	..	1	3	29,197	2	..	2
Sambodja	4	..	..	4	7,913	..	..	..	..	.....	..	..	..
Talang Akar-Pendopo	..	..	..	..	.....	49	..	2	51	159,062	11	3	14
Talang Djimar	1	..	..	1	17,132	14	1	..	15	60,929	3	..	3
Tandjoeng Tiga	1	..	..	1	7,503	3	..	..	3	21,837	2	..	2
Wildcats	..	..	..	..	.....	..	..	1	1	9,504	1	..	1
Total	65	2	1	68	166,981	102	2	17	121	476,571	31	9	40

Engineering and Geological Data on East Indies Fields

COUNTRY, REGION AND FIELD	Range of Gravity Oil (API)	PRODUCING FORMATIONS			Type of Structure
		Name	Kind	Age	
BORNEO					
Anggana-Moeara	19–33	Balikpapan Series and Poeloe Balang	Sands and Shale	Miocene	Anticline
Sambodja	14.5-34	" " "	Shale	Miocene	Anticline
Sanga Sanga	18–36	" " "	Shale	Miocene	Anticline
Tandjoeng	40	.....	Sands, Frit—Sands and Shale	Eocene	Anticline
Tarakan	20	Tarakan Series	Sands and Shale	Pliocene	Anticline
BRUNEI					
Seria	19–33	.....	Sands	Tertiary	Anticline
CERAM					
Boela-Lemoen	23	Boela	Sand, Shale	Pliocene-Tri.	Faulted Anticline
JAVA					
Kawengan	34.5	Ngrajong	Sand, Limestone, Marl	Tertiary Mio.	Anticline
Kroeka	30.5	Globegerinae	Lime, Sand, Shale	Tertiary Mio.	Anticline
Ledok	43	Wonotjolo Ngrajong	Sand, Sandy Limestone, Marl	Tertiary Mio.	Anticline
Loesi	40	.....	Sand	Tertiary	.....
Ngliron	40	.....	Sand	Tertiary	.....
Nglobo-Semanggi Banjoeasin	43	Wonotojolo Ngrajong	Sand, Sandy Limestone, Marl	Tertiary Mio.	Anticline
Petak	40	.....	Sand	Tertiary	.....
Soerabaja	24.5	Globegerinae	Lime, Sand, Shale	Tertiary Mio.	Anticlines
Tremboel	40	.....	Sand	Tertiary	.....
NETHERLANDS NEW GUINEA					
Klamono	19	Klasafet	Lime	Miocene	Anticline
Mogoi	46	Klasafet	Lime	Miocene	Anticline
Wasian	48	Klasafet	Lime	Miocene	Anticline
SARAWAK					
Miri	21.5-35	.....	Sands	Tertiary	Anticline
SUMATRA					
Northern Sumatra					
Dj Rajeu	54.5	Seuroela	Sand, Shale	Pliocene	Anticline
Gebang	54	Keutapang	Sand, Shale	Miocene	Anticline
Pangkalan Soesoe	56	Keutapang	Sand, Shale	Miocene	Anticline
Paleoh Taboehan	52.5	Keutapang	Sand, Shale	Miocene	Anticline
Pase	23-30	.....	Sand	Tertiary	.....
Perlka	57	Keutapang	Sand, Shale	Miocene	Anticline
Poeloe Pandjang	55.5	Keutapang	Sand, Shale	Miocene	Anticline
Rantau	48.5	Keutapang	Sand, Shale	Miocene	Faulted Anticline
Serangdjaja	64.5	Keutapang	Sand, Shale	Miocene	Anticline
Central Sumatra					
Lirik	34	.....	Sand	Tertiary	.....
Southern Sumatra					
Badjoebang	46.5	Lower Palembang	Sand, Shale	Tertiary Mio.	Faulted Anticline
Benakat	38	.....	Sand	Tertiary	.....
Betoeng	40.5	Lower Palembang	Sand, Shale	Tertiary Mio.	Anticline
Djirak	38	.....	Sand	Tertiary	.....
Kenali Asam	22-46.5	Lower Palembang	Sand, Shale	Tertiary Mio.	Faulted Anticline
Kloeang	40	Lower Telissa Series	Lime, Sand, Shale	Tertiary Mio.	Faulted Anticline
Limau	25.5	Lower Telissa Series	Sand, Shale	Miocene	Faulted Anticline
Mangoendjaja	24.5	Middle and Lower Palembang	Sand, Shale	Tertiary Plio. and Mio.	Anticline
Moeara Senami	48	Lower Palembang	Sand, Shale	Tertiary Mio.	Anticline
Moeara Enim (Batoe Kras)	46	Middle and Lower Palembang	Sand, Shale, Coal	Tertiary, Plio. and Mio.	Anticline
Radja	40	.....	Sand	Tertiary	.....
Selo	38	.....	Sand	Tertiary	.....
Soeban Djerigi	46	Middle and Lower Palembang	Sand, Shale, Coal	Tertiary, Plio. and Mio.	Anticline
Talang Akar-Pendopo	38	.....	Sand	Tertiary	.....
Talang Djimar	28.5	Lower Telissa Series	Sand, Marl	Miocene	Faulted Anticline
Tandjoeng Loentar	56	Middle and Lower Palembang	Sand, Shale, Coal	Tertiary Plio. and Mio.	Anticline
Tandjoeng Tiga	25	Lower Telissa	Sand, Marl	Tertiary Mio.	Faulted Anticline
Tempino	48	Lower Palembang	Sand, Shale	Tertiary Mio.	Faulted Anticline

SUMATRA—Southern Oil Area



AUSTRALIA

THE exploratory activity in Australia, which has been gaining impetus for the past couple of years, has resulted during 1948 in the completion of a substantial amount of preliminary survey work on the part of a number of operators, with location selected for at least one deep wildcat test.

The Government's Bureau of Mineral Resources is making a magnetic and gravity study of the Roma district where a number of wells have been drilled in the past, many of which have shown oil or gas, but where no commercial production has been developed. It has also started a seismic survey in the area which should be completed some time late in 1949 and which should be a great benefit in helping to correlate the results of the shallow drilling carried on in the area for a number of years past. The Bureau has also had crews in the Kimberleys for more than a year, doing work which will be of value as basic information for more detailed studies.

The most active private companies have been Shell (Queensland) Development Company, Frome-Broken Hill Company, Zinc Corporation Limited, Vacuum Oil Company Pty. Ltd., D'Arcy Exploration Company, Freney-Kimberley Company, and others.

During 1948 the Shell company completed a program of geological and geophysical work which also included a considerable amount of core drilling in the eastern part of Queensland around Warrinilla and Rolleston. It has now made location for a deep wildcat, for which drilling equipment was being moved in early in 1949.

In the southwestern part of the Great Artesian Basin the Australian Zinc Corporation has continued geophysical work in which it was at first joined by D'Arcy and Vacuum who later discontinued their participation. The Zinc Corporatoin later drilled a wildcat to a depth of 3256 feet at Kopperamanna, northwest of Lake Fromme. The same companies are carrying on some work in the Desert Basin of Western Australia, where the Freney-Kimberley company is reported preparing to resume work on a wildcat started before the war on the Nerrima structure. At that time it had been carried to a depth of 4270 feet before work halted, and in the meantime the company has done a considerable amount of geophysical work in the area.

Another interesting area is the Northwest Basin of Western Australia, where the Australian Motorists Petrol Company Limited and Oil Search Limited hold a considerable amount of acreage under exploration permits. The area extends from Shark Bay to above Exmouth Gulf.

A proposal has been made for a project in the Callide area, in central Queensland, for extracting oil from coal. The general area is one of the larger coal bearing basins of the world according to some reports, and many deposits exist near the surface.

In the Gippsland Area, Victoria, Lakes Oil Limited is working on the horizontal drilling projects originally started by the Commonwealth and State Governments. A 1156-foot shaft has been sunk, ending in a work chamber from which holes are being drilled horizontally into low-pressure glauconitic sands. No commercial quantities have yet been obtained, but the project is still in its early stages. A small amount of oil is obtained from this area from wells drilled in the Lakes Entrance field, but it is thought that better return could be had from such beds by the Ranney Method now being tried.

Refineries of Australia

State and Company	Location of Plant	Crude Charging Capacity (Bbls.) Daily)	Cracking Capacity (Bbls.) Daily)	Type of Refinery	Operating Status
New South Wales:					
Bitumen & Oil Refineries, Ltd. (Cal-Tex.)	Bunnerong (South Sydney)	1,700	None	Skimming	Operating
National Oil, Ltd	Glen Davis	6,000	1,000	Shale Oil Distillation	Operating
Shell Oil Co. of Australia, Ltd	Clyde	6,000	None	Complete	Operating
Victoria:					
Commonwealth Oil Refineries, Ltd. (Anglo-Iranian)	Laverton	3,500	None	Skimming	Operating
Vacuum Oil Co. (Standard-Vacuum)	Altona	1,300	None	Skimming, Lube, Asphalt	Building

NEW ZEALAND

WITHIN recent months there have been reports of a possible revival of the oil search in New Zealand. Virtually abandoned during the past two years since no new oil had been found, and production was negligible. It is planned to drill some additional wells in the Moturoa field, which along with Taranaki field had produced a cumulative total of 80,000 barrels of oil, in an attempt to extend its limits. The current dollar shortage is partially responsible for the interest in making every effort to develop production.

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A

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Agency: Smith, Taylor & Jenkins, Inc.
Atlas Well Service Corp. 4
Agency: Wallace Davis & Company
Avondale Marine Ways, Inc. 40
Agency: Calvert, Whitlock & Williams
***Axelson Manufacturing Co.** 142
Agency: Heintz & Co., Inc.

B

***Baash-Ross Tool Co.** 73
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Agency: Bryan & Bryan, Advertising
Bryan Gas Lift Equipment Co. 17
***Bucyrus-Erie Co.** 6
Agency: Bert S. Gittins, Advertising

C

***Camco, Inc.** 114
Agency: Brennan Advertising Agency
***Cameron Iron Works, Inc.** ..... 155 and 230
Agency: Rives, Dyke & Company
***Cardwell Manufacturing Co.** 266-267
Agency: The Paul A. Lago Co.
Century Geophysical Corp. 246
Agency: Gibbons Advertising Agency, Inc.
Chicago & Southern Airlines 148
Agency: Wilhelm-Laughlin-Wilson & Associates
***The Cleveland Trencher Co.** 11
Agency: Gates-Bourgeois Adv. Agency
The Continental Supply Co. ..... Insert 160-161
***The Cooper-Bessemer Corp.** 80-81
Agency: The Griswold-Eshleman Co.
Phil A. Cornell & Co. 185
Agency: Advertising Service Co.

E

Electro-Technical Laboratories, Inc. 18
Agency: Greer, Hawkins & Allen, Inc.

■ CONTINUED ON PAGE 276